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U. S. DEPARTMENT OF THE INTERIOR

*ANNUAL REPORT OF THE
COMMISSIONER OF
RECLAMATION*

*TO THE SECRETARY OF THE INTERIOR
FOR FISCAL YEAR ENDED JUNE 30, 1929*

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UNITED STATES DEPARTMENT OF THE INTERIOR

RAY LYMAN WILBUR, *Secretary*

BUREAU OF RECLAMATION

ELWOOD MEAD, *Commissioner*

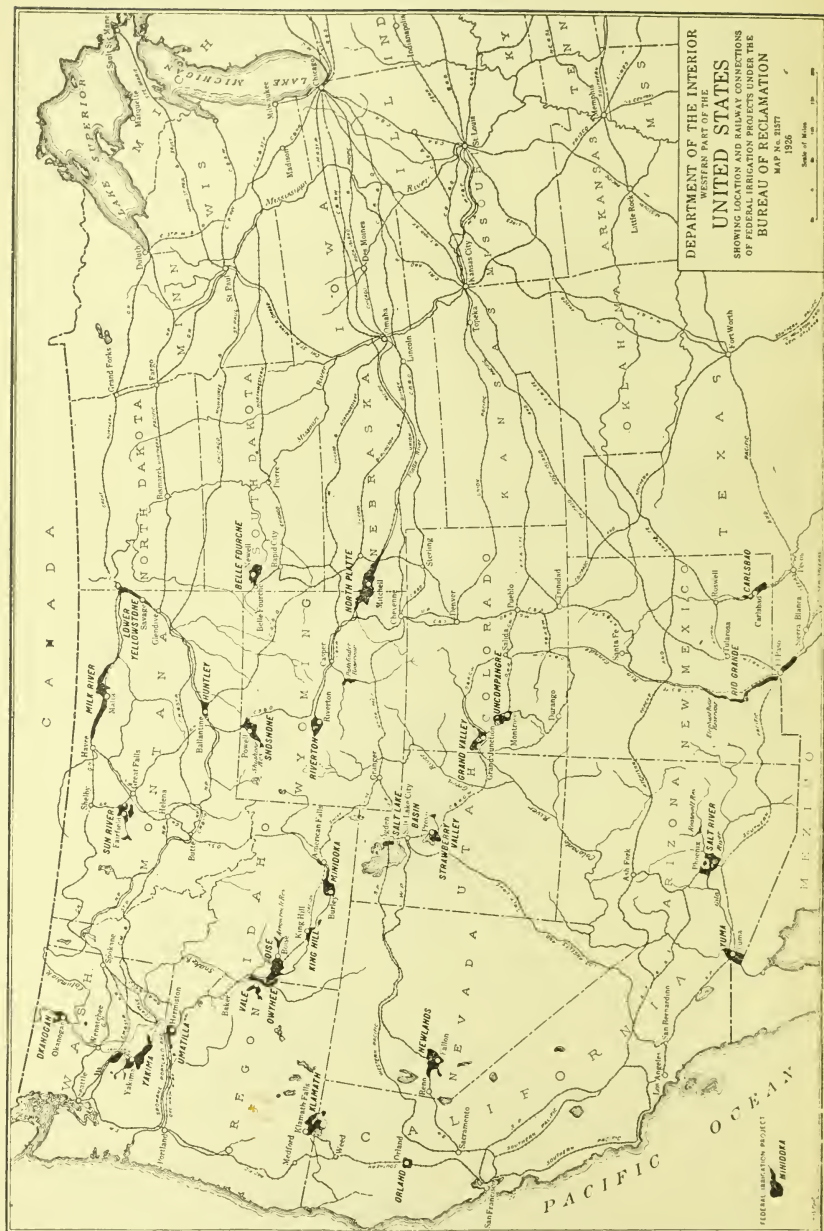
TWENTY-EIGHTH ANNUAL REPORT
OF THE
COMMISSIONER OF RECLAMATION

*Transmitted to Congress in pursuance of the Act of June 17, 1902
(32 Stat. 388)*

FOR THE
FISCAL YEAR ENDED JUNE 30, 1929



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1929



DEPARTMENT OF THE INTERIOR
WESTERN PART OF THE
UNITED STATES
SHOWING LOCATION AND RAILWAY CONNECTIONS
OF FEDERAL IRRIGATION PROJECTS UNDER THE
BUREAU OF RECLAMATION
MAP No. 21577
1926

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TWENTY-EIGHTH ANNUAL REPORT OF THE COMMISSIONER OF RECLAMATION

WASHINGTON, D. C., *October 8, 1929.*

SIR: The area irrigated in 1928 with water from Government works was 2,677,100 acres, an increase of 149,995 acres over that of 1927.

The area cropped was 2,681,270 acres, an increase of 177,224 acres.

The total value of crops was \$143,573,070, an increase of \$10,365,860 compared with 1927.

The construction payments were \$4,387,813.80, an increase of \$932,049.11 compared with the previous year.

The payments received for operation and maintenance were \$1,920,500.57, or \$77,115.71 greater than in the previous year.

The total payments in the fiscal year 1929 amounted to \$6,308,314.37, compared with \$5,299,149.55 in 1928, an increase of \$1,009,164.82.

The income to the Bureau of Reclamation during the fiscal year was \$9,851,438.62, or \$548,108.37 greater than in the previous year.

The operation expense for the year was \$1,786,928.81, an increase compared with the previous year of \$23,976.14.

Excess of operation and maintenance receipts over expense for the period amounted to \$133,571.76, compared with an excess of \$80,432.19 for the previous year.

The amount appropriated for construction was \$12,286,500, compared with \$9,869,000 the previous year, both figures exclusive of reappropriations.

The amount expended on construction was \$7,898,304.69, compared with \$6,966,449.25 the previous year.

Works now under construction under the 10-year program, announced in 1927, involve an ultimate expenditure of about \$80,000,000. This program provides for the construction of new projects authorized by Congress, exclusive of the Boulder Canyon project, and the completion of old projects.

The Bureau of Reclamation has a revolving fund of about \$172,000,000 invested in reclamation projects. As the settlers refund to the Government the cost of construction and operation, the fund is replenished and money becomes available for the construction of new projects. Regular repayments are being made to the Government by 22 projects, and only two completed projects have not yet reached a repayment status. Other accretions to the revolving fund come from the sale of public lands, the receipts from which source last year amounted to \$647,236.95, and from royalties from oil leases, which last year added \$1,852,785.03 to the fund.

BOULDER DAM

The Boulder Canyon project act was approved by President Coolidge on December 21, 1928, and was made effective by the following proclamation of President Hoover on June 25, 1929:

Pursuant to the provisions of section 4 (a) of the Boulder Canyon project act approved December 21, 1928 (45 Stat. 1057), it is hereby declared by public proclamation:

(a) That the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming have not ratified the Colorado River compact mentioned in section 13 (a) of said act of December 21, 1928, within six months from the date of the passage and approval of said act.

(b) That the States of California, Colorado, Nevada, New Mexico, Utah and Wyoming have ratified said compact and have consented to waive the provisions of the first paragraph of Article XI of said compact, which makes the same binding and obligatory only when approved by each of the seven States signatory thereto, and that each of the States last named has approved said compact without condition, except that of six-State approval as prescribed in section 13 (a) of said act of December 21, 1928.

(c) That the State of California has in all things met the requirements set out in the first paragraph of section 4 (a) of said act of December 21, 1928, necessary to render said act effective on six-State approval of said compact.

(d) All prescribed conditions having been fulfilled, the said Boulder Canyon project act approved December 21, 1928, is hereby declared to be effective this date.

In testimony whereof I have hereunto set my hand and caused the seal of the United States of America to be affixed.

Done at the city of Washington this twenty-fifth day of June, in the year of our Lord one thousand nine hundred and twenty-nine, and of the [SEAL] Independence of the United States of America the one hundred and fifty-third.

HERBERT HOOVER.

By the President:

HENRY L. STIMSON,

Secretary of State.

During the latter part of June the Secretary of the Interior, in company with the commissioner and the chief engineer of the Bureau of Reclamation, visited the Boulder Dam site at Black Canyon. Plans were outlined for the development of a railway line to the dam and the construction of a camp for the engineers and workmen near the dam site. Conferences were held with representatives of the various States, municipalities, and power companies interested in the contracts for the sale of power, which must be let before actual work is begun on the construction of the dam and power plant. The Secretary announced the policy of preferring to sell falling water as the basis of these contracts.

Conferences have been held with officials of the Union Pacific System to evolve the most feasible scheme for rail facilities to the dam site. The present plan calls for the construction by the Union Pacific of a branch line from Las Vegas, Nev., to a switching yard about midway between that town and the dam site. From this point

two Government constructed and operated railroads will run, one to the rim of the canyon above the point where the dam will be constructed and the other down into the canyon to a point just below the dam. Field parties have located the most feasible route for these lines.

Such preliminary work as was possible has been carried on by the Bureau of Reclamation. A contract was entered into with the Imperial Irrigation District and the Coachella Valley County Water District, which provides for a maximum expenditure of \$100,000, payable equally by the United States and the two districts, under which the bureau has placed a force of men in the field to make the necessary surveys and investigations to determine definitely the location and estimated cost of the All-American Canal.

As the dam will be under construction over a period of eight years at the bottom of a narrow canyon, where the heat in the summer is intense, considerable thought is being given to making suitable provision for the health and comfort of the workmen. The camp site has been located where it will have the advantage of the prevailing winds. The buildings will be of a permanent type, suitable to the climatic conditions, and capable of housing from 3,000 to 4,000 persons, about 1,000 of whom will be employed on the work. Plans are being made for the construction of a refrigeration plant and for a domestic water supply which will be pumped 1,000 feet from the Colorado River. Elevators, with a lift of 1,000 feet, will carry the employees to and from their work in the canyon.

The large amount of paper work incident to the preparation of designs and to the calculation of stresses will necessitate increasing the force of employees in the Denver office of the bureau from 60 to more than 100. Steps are being taken to obtain these men through the regular civil-service channels.

ECONOMIC SURVEY OF RECLAMATION

The results on a majority of the Federal reclamation projects fully justify the national policy. A great wealth in land has been created, farmers are prosperous, and the payments required under the contracts are being made.

There is general agreement that the engineering operations of the Bureau of Reclamation are well conceived and capably carried out, but we are still drifting with regard to the economic principles and policies which should govern our conclusions as to feasibility or shape development of projects. Reclamation requires more than canals and reservoirs. The qualifications of settlers, the kind of agriculture which should be followed, and, in general, those factors which determine earning power and well-being and contentment of the people of the communities created are as important as the engineering factors.

Because of these conditions, the Secretary approved an economic survey of reclamation during the summer of 1929, designating for this purpose certain Federal projects where works are completed, others where works are being constructed, and certain private projects in financial distress where Government aid is asked.

The field of the survey included the following:

Palo Verde irrigation district, California.
Stanfield irrigation district, Oregon.
Westland irrigation district, Oregon.
West Extension irrigation district, Umatilla project, Oregon.
Hermiston irrigation district, Umatilla project, Oregon.
Horsefly irrigation district, Oregon.
Shasta View irrigation district, Klamath project, Oregon-California.
Malin irrigation district, Klamath project, Oregon-California.
Owyhee project, Oregon-Idaho.
Duck Valley project, Oregon.
Bitter Root irrigation district, Montana.
Malta and Glasgow divisions, Milk River project, Montana.
Chinook division, Milk River project, Montana.
Greenfields division, Sun River project, Montana.
Lower Yellowstone project, Montana-North Dakota.
Gem irrigation district, Idaho.
Emmett irrigation district, Idaho.
King Hill project, Idaho.
Orchard Mesa division, Grand Valley project, Colorado.
Belle Fourche project, South Dakota.
Northport division, North Platte project, Nebraska-Wyoming.
Willwood division, Shoshone project, Wyoming.
Riverton project, Wyoming.

The investigation of these projects was under the general supervision of the Director of Reclamation Economics. As a preliminary to the field work a conference was held in Billings, Mont., which was attended by those participating in the survey and by a large number of representatives of the settlement and development departments of the transcontinental railroads traversing the projects, the beet sugar companies, the Federal land banks, the agricultural colleges, and other interested in reclamation problems. A profitable two days was spent in a discussion of the economic problems a solution of which was sought and the best methods of eliciting the information desired. Immediately following the conclusion of the conference the investigators began the survey of the projects to which they had been assigned.

The reports of the investigations will be correlated by a special committee, which will prepare a final report and recommendations for submission to the Secretary. It is believed that the data obtained from this economic survey will be most helpful in determining what can and should be done to improve conditions on these projects and in aiding Congress in enacting desirable legislation.

CONSTRUCTION DURING THE FISCAL YEAR

Stony Gorge Dam, Orland project, California, was completed in October, 1928. Gibson Dam, Sun River project, Montana, was practically completed at the end of the fiscal year. Echo Dam, Salt Lake Basin project, Utah, was about 40 per cent completed and the Owyhee Dam, Owyhee project, Oregon-Idaho, 14 per cent. Work continued on the construction of Easton diversion dam and the canal system on the Kittitas division of the Yakima project, Washington, and on the main canal and Harper diversion dam on the Vale project, Oregon. The following table gives data concerning the dams under construction during the fiscal year:

DAMS UNDER CONSTRUCTION BY THE BUREAU OF RECLAMATION

[Cost includes dam, spillway, outlet works, and bridges on dams, but does not include auxiliary features such as right of way, roads, and clearing reservoir site]

Project	Name	State	Type	Maximum height	Crest length	Volume	Estimated cost
				<i>Feet</i>	<i>Feet</i>	<i>Cubic yards</i>	
Owyhee.....	Owyhee.....	Oregon.....	Concrete arch-gravity.	405	835	525,000	\$5,378,125
Salt Lake Basin.....	Echo.....	Utah.....	Earth and rock fill....	125	1,800	1,676,000	1,645,500
Sun River.....	Gibson.....	Montana.....	Concrete arch.....	205	882	160,000	2,627,600
Vale.....	Harper.....	Oregon.....	{ Concrete gravity with earth and rock fill embankment.	30	700	{ 1,570 8,000 }	70,000
Yakima.....	Easton.....	Washington.	Concrete gravity with ogee weir section.	65	248	5,500	200,000

¹ Exclusive of cost of constructing railroad.

The total length of canals, ditches, and drains constructed to the end of the fiscal year amounted to 16,557 miles. Tunnels numbered 122 and totaled 175,536 feet in length. Concrete and wood canal structures numbered 148,462; bridges, 11,631, with a total length of 277,449 feet; and culverts, 14,043, with a total length of 535,396 feet. The amount of concrete, metal, tile, and wood pipe laid to the end of the fiscal year amounted to 4,091,096 linear feet, and there had been constructed 4,811 concrete, metal, and wood flumes totaling 853,022 feet in length. Telephone lines amounted to 3,350 miles and transmission lines, 2,056 miles. The 35 power plants developed 166,128 horsepower. Excavation during the fiscal year amounted to 9,996,368 cubic yards of earth, indurated material, and rock, bringing the total to the end of the year to 276,822,500 cubic yards. Riprap totaled 2,533,787 cubic yards; paving, 1,080,328 square yards; and concrete placed, 4,191,553 cubic yards.

CONTRACTS

One index of the bureau's activities during the year is the number of contracts entered into and the different subjects involved, which are summarized in the following table:

Nature of contracts	Number of contracts	Amount involved
Cooperative investigations.....	7	\$112, 545. 00
Supplies.....	516	236, 962. 38
Material.....	340	765, 713. 68
Equipment.....	144	224, 006. 50
Miscellaneous services.....	94	69, 837. 29
Construction work.....	46	2, 746, 039. 68
Land purchases, including improvements.....	111	45, 005. 76
Land sales, including improvements.....	10	6, 360. 07
Leases to the United States.....	23	17, 803. 50
Leases from the United States.....	283	125, 742. 08
Compromise of damages.....	5	1, 565. 01
Rental of Government equipment.....	56	8, 604. 84
Rental of water.....	479	340, 311. 18
Sale of surplus electrical energy.....	34	284, 904. 33
Sale of water rights to towns.....	3	9, 542. 70
Sale of water rights under the Warren Act.....	8	322, 770. 00
Sale of water rights within projects.....	53	85, 763. 91
Adjustment and relief.....	4	1, 405, 840. 00
Transfer of project operations.....	1	310, 000. 00
Miscellaneous.....	118	55, 576. 10
	2, 335	¹ 7, 174, 894. 01

¹ Estimated in part.

INVESTIGATIONS OF OPPORTUNITIES FOR PLANNED GROUP SETTLEMENT IN THE SOUTH

Little was done by the bureau in connection with the investigations of planned group settlement in the South under an appropriation of \$15,000 carried in the act of March 7, 1928, other than a preliminary survey of a tract of land near Artesia, N. C., and five tracts of land suggested by the State authorities of Florida, located in Jefferson County, about 9 miles south of Monticello; in Union County near Lake Butler; in Volusia County, about 15 miles south and west of New Smyrna; in Hardee County near Wauchula; and in Broward County.

In the spring of 1929 a committee of representative men from the South presented the matter to President Hoover and to the Secretaries of Interior and Agriculture, with the result that bills were introduced in Congress by Senator Simmons of North Carolina, and Representative Whittington of Mississippi, authorizing the creation of organized rural communities to demonstrate the benefits of planned settlement and supervised rural development. Hearings on the Senate bill were held before the Senate Committee on Irrigation and Reclamation in May, and the bill was favorably reported to the Senate on June 3, but no further action was taken.

During the fall of 1928 a study of economic and social conditions in the South was made by Dr. E. C. Branson, Kenan professor of rural social economics, of the University of North Carolina, and published by the bureau under the title, "Planned Colonies of Farm Owners." The associated committees on southern rural development also issued a pamphlet entitled "Southern Rural Life: The Problem, the Solution."

The investigations of the Bureau of Reclamation in the South have shown that this section of the country has all of the material conditions for an attractive and prosperous rural life. These include a long growing season, adequate rainfall, soils which, if adequately fertilized, will be highly productive, land flat or gently rolling, where injury from erosion can be easily controlled. It has in addition fine transportation facilities and nearness to the largest cities of the country.

The climate and soil make it possible for this region to be self-supporting in an agricultural sense and to supply some of the most needed and most valuable products of the country. It needs a well-rounded agricultural program. There are many sections which should be hopeful and prosperous which have a declining and decadent rural life. This is wholly due to economic and human conditions which can and should be improved.

The valuable agricultural agencies operating in the South, in the colleges, experiment stations, and demonstration farms, can not overcome some of these handicaps. The lessons of the demonstration farm or the teaching of the extension service go unheeded by the tenant farmer living on a low income, with a drab social existence, and following much the same practices as those around him.

The South needs planned and organized rural communities which will be little worlds in themselves, cooperating not only to make the best use of their own farms, but to broaden their markets and effect economies in sales by combining their efforts and resources. Each community unit should be large enough to have an agriculture, a life and spirit of its own, and to be economical and efficient in its business affairs. The now existing rural life which is peculiar to the South, where everyone pursues his own calling without regard to the interests and industry of his neighbors, where all his interests are bounded by his own farm fences, is in striking and disagreeable contrast to what can be achieved if, in place of this, people are selected because they have a common purpose, are given an opportunity to own the land they cultivate, and have an economic and social partnership. The lessons of other countries have shown the feasibility of such communities. The benefits in the South of such examples can not fail to be widespread and of enduring value, and they should be of real interest to the State governments concerned.

No appropriation was made by Congress in the act of March 4, 1929, for a continuation by the bureau of the investigatory work in the South during the fiscal year 1930.

*ECONOMIC AND ENGINEERING OPERATIONS**SALT RIVER PROJECT, ARIZONA*

Economic.—Of the 9,800 irrigated farms on the Salt River project, 7,135 were operated by owners and 1,165 by tenants. All land is privately owned, and the project is fast being recognized as a land of suburban homes. The elaborate system of paved roads, the warm winters, numerous recreational and resort features, and the availability of electricity on every farm under the program just financed, are factors which are bringing increasing numbers of well-to-do home seekers to the valley.

Agricultural conditions are favored by the 12 months' growing season, making two crops possible on the same land. The three major crops from an acreage standpoint are alfalfa, cotton, and grain. Gross receipts from all crops last year were \$26,082,055. In addition, livestock was valued at \$6,145,950.

Engineering.—A fourth big dam on Salt River at Stewart Mountain, 10 miles below Mormon Flat Dam was started October 1, 1928, under a \$5,100,000 bond issue sold by the Salt River Valley Water Users' Association on May 28, 1928. This bond issue also provides for the construction of power lines to serve every farm on the project. The gross income from the sale of power during the fiscal year was \$2,406,479.62.

Drainage is accomplished almost entirely by pumping. Some 15.85 miles of open and 5.3 miles of closed drains had been constructed prior to 1922, but are now effective merely to carry off pumped or other water discharged into them, since the ground water level has been lowered below the bottoms of the drains. In 1918 a third of the 240,000 acres of project land was threatened with water-logging and had a water table within 10 feet or less of the surface. The water table is now everywhere below the point where it is injurious and not over 1,900 acres have water within 10 feet of the surface. One hundred and eighty-six pumps are operated on the project, and the maximum capacity is approximately 800 second-feet. Most of the water is used for the irrigation of project land or of land in outside districts.

In addition to the above, the association in 1927 sold 26 pumping plants, having a capacity of 135 second-feet, to the Roosevelt irrigation district, which has since installed and operates within the Salt River project an additional 29 pumping plants with a capacity of 257 second-feet. The operation of these pumping plants by the district assists in the drainage of the Salt River project.

YUMA PROJECT, ARIZONA-CALIFORNIA

Economic.—Of the 1,599 irrigated farms on the Yuma project, 878 or 55 per cent were operated by tenants during 1928 and 721 or 45 per cent by owners or managers. The 132 farms on the Yuma auxiliary project were all operated by owners or managers. The increase in the number of tenant farms is due largely to the different system used in reporting the crop census returns on the reservation division. Previously the practice had been to group the 10-acre Indian allotments, which are in general farmed by white tenants, into 40-acre tracts. In 1928 each allotment of 10 acres was considered as a separate tract with the result that an increase was shown both in the number of farms reported and in the number of tenant-operated farms.

Economic conditions generally are more favorable than for several years previous. A comprehensive building program is under way both on the farms and in the city of Yuma. Bonds have been sold for improvements to the school systems. This betterment of economic conditions is also reflected in the payment of water-right charges. Delinquencies were reduced during the year from 5.36 per cent to 2.92 per cent.

Development on the Yuma Mesa has shown a steady growth. Eighty-five acres of citrus orchard were planted during the spring of 1929. Unquestionably greater development would have resulted if an adequate supply of good grade nursery stock had been available. However, by the spring of 1930 there will be an abundant supply from both the valley and mesa nurseries. The numerous recent inquiries regarding the Yuma Mesa indicate a more rapid development next spring.

Engineering.—During the year 4 miles of open drain were completed in the valley division, thereby relieving approximately 34,500 acres to date. It will also be necessary to extend the main drain approximately 2 miles through an area in the upper end of the valley division that develops an abnormally high water table and seeps to some extent during high river stages. This area is influenced directly by the river and reacts to changes in the river stage.

The cost of maintenance is increasing on the smaller laterals of the project. This is due to the widening of the canal banks made necessary in disposing of the spoil cast up while cleaning with the dredgers. On account of this and the raising of the water surface elevations over the entire system, consideration should be given to lining the smaller canals with concrete. This would eliminate the deposition of silt and also prevent the growth of grass and weeds which is very rapid during the summer months, and obstructs the flow of water to such an extent that the canals are quickly silted up, thereby destroying the efficiency of this part of the distribution system.

ORLAND PROJECT, CALIFORNIA

Economic.—Of the 695 irrigated farms on the project, 534 were operated in 1928 by owners and managers and 161 by tenants. Improvement in the project's economic condition was indicated conclusively by the results of the year, among the most important being a reduction of \$3,500 in unpaid charges, notwithstanding the accrual of nearly \$100,000 additional charges during the year. The acre crop yield was the highest since 1919. The cropped area and the irrigable area were the largest in the history of the project. Bank deposits were exceeded only by those of the previous year.

Advertising of 64 project farms, comprising nearly 1,800 acres of land under option to the United States by the owners for advertisement and sale, was started near the close of the preceding year and continued until April. Advertising funds were provided by local real estate firms and interested land owners in cooperation with the water users' association. The original options, which were executed in 1927, expired at the close of 1928, but a large majority of the owners extended them for another 12-month period. More than 400 inquiries, responding to the advertisements of project farms, were received; 18 applications were filed, and 3 of the farms under option were sold. In addition, two buyers were attracted to Orland and purchased project property, other, however, than the farms under option. Advertising plans were formulated and funds provided at the close of the year for the 1929 campaign.

Dairying and alfalfa raising continued to be among the most stable and profitable lines of farming. As in recent years, little alfalfa was shipped from the project. Butter production of the two Orland creameries amounted to 1,384,000 pounds, which is in excess of that for any previous year. Local cooperative (subsidiaries of State-wide marketing organizations) were instrumental in selling profitably the season's crop of almonds, oranges, and olives.

Collections exceeded accruals and the delinquency in payment of charges at the close of the year was only 7.6 per cent of the total accruals for the five years for which there are unpaid charges.

Engineering.—Construction of Stony Gorge Dam, which had been in progress for two years, was finished in October. During the year, 1,010 cubic yards of concrete and 112,600 pounds of reinforcing steel were placed in the dam and more than 500,000 pounds of operating equipment and machinery were installed. Future work will consist of placing small quantities of concrete lining each year on those sections of the distribution system where further operation demonstrates the necessity therefor in the interest of reduced maintenance costs and increased operating safety. During the year, 3,379 square yards of such lining were placed on 2,427 linear feet of project laterals.

GRAND VALLEY PROJECT, COLORADO

Economic.—The repayment contract of January 4, 1928, with the Grand Valley Water Users' Association is in process of confirmation by the court after which it will be finally executed. Pending this action the association has paid the first two construction installments, advanced \$48,000 for operation and maintenance cost in 1928, and on June 30, 1929, had advanced 80 per cent of the announced operation and maintenance cost for 1929.

The Orchard Mesa irrigation district paid the first installment of the construction charge due in 1927, but was delinquent about 55 per cent of the installment due December 1, 1928.

Crops for the season of 1928 were generally satisfactory. Alfalfa hay covered the largest area. Beans, grain, tomatoes, and similar crops gave good returns. Sugar beet yields were low and the planting in 1929 was considerably reduced.

There was little increase in the cultivated area either in the gravity division or on Orchard Mesa, and probably 150 good farmers are needed to occupy the available land.

UNCOMPAHGRE PROJECT, COLORADO

Economic.—The most notable improvement during the past year has been the fact that more farms were operated by owners than by tenants. This is the first year since 1924 in which the percentage has been in favor of the owners. During the irrigation season of 1928, 1,770 farms were irrigated and of this number 928, or 52 per cent, were farmed by owners and 842, or 48 per cent, by tenants.

The average crop return per acre was \$37.29 for 1928, an increase of \$9.93 over that for 1927. This favorable per-acre crop return was due largely to the excellent prices received for both the alfalfa and onion crops. The total gross return from the onion crop amounted to more than 29 per cent of the total for all crops and that from the alfalfa crop to 22 per cent of the total.

All project water users benefited from the increased returns from the alfalfa crop, but returns from the onion crop reached only a small percentage of the project water users. Low prices were received all season for potatoes, which is the principal money crop on the project.

There appears to be some little movement back to the farm. A number of farms were sold at reasonable prices and three farm units were filed on.

The beet sugar factory at Delta, Colo., handles all beets raised on the project and also refines the sirup from the Grand Junction factory. The 3 flour mills, 3 elevators, 2 creameries, and 2 cheese factories on the project are doing a flourishing business. A veneer and box factory was built at Montrose during the summer of 1928

and is well equipped with modern machinery. Quaking aspen lumber is used for making boxes and the location on the project is considered excellent, owing to the availability of the raw material.

The Colorado Potato Growers' Association is the principal marketing association of the project and handles potatoes and onions principally. A poultry marketing association has also been organized and is on a substantial basis. An association for grading and marketing hogs has also been organized and is doing a good business. Cooperative oil, gasoline, and service stations were established during the year at Montrose and Delta and appear to be doing an excellent business.

Engineering.—Approximately 4 miles of open ditch drains were constructed during the fiscal year by Government-owned draglines rented to project water users under contracts wherein the water users advanced the estimated cost of the drainage work. Eight such contracts were completed.

BOISE PROJECT, IDAHO

Economic.—Of the 3,797 irrigated farms, 2,114 were farmed in 1928 by owners or managers and 1,683 by tenants. All farms acquired through foreclosure proceedings during the deflation period following the war have been sold. Farms are still being sold at rather low prices, but the demand is good. The demand for farms for rent has been greater than the supply. Class 5 lands have been reviewed and a large proportion placed in the paying class or dropped entirely as class 6.

The dairy business and poultry raising are gradually expanding and produce dependable incomes. Cooperative creameries and canning factories are increasing in number. Potato, onion, and fruit growers are perfecting their cooperative marketing associations, and better returns from these crops are anticipated.

Engineering.—Drainage construction and improvement work on the main canal, provided for in the repayment contracts, have been continued. For the Payette division, right-of-way questions have been settled and bids invited for the construction of the Deadwood storage dam. A contract has been executed with the Black Canyon district for the construction of drains to the amount of \$40,000.

KING HILL PROJECT, IDAHO

Economic.—Of the 185 irrigated farms on the project 120 were operated by owners and 65 by tenants. A considerable acreage of potatoes was planted this year and the price was fair but the yield was poor, amounting to about 40 sacks per acre. The acreage of alfalfa hay was greatly reduced, owing to disease, and most of the

hay land was plowed up and seeded to potatoes and grain. More red clover was seeded this year and there is a tendency to raise clover seed. Corn did very well. A number of farmers are dairying. The project is being operated by the King Hill irrigation district. The project has asked for an advance of money to repair its canal system. This the bureau has felt constrained to refuse because the water users have not been able to repay any of the money spent heretofore on construction.

MINIDOKA PROJECT, IDAHO

Economic.—The number of farm units on the project increased from 2,390 in 1927 to 2,433 in 1928. Of this number, 2,287 farms, or 94 per cent, were cultivated. Tenantry remained at about 44 per cent of the total number of farms.

The population of the project increased from 15,040 in 1927 to 17,015 in 1928. Of this increase, the greater part, or 1,329, was on the farms, the gain in the cities numbering 645. Sales of farm property continued fairly steadily throughout the year, at prices ranging mostly from \$100 to \$150 per acre, but in a few cases rising to \$300 to \$400 per acre.

All crops made a good yield and prices were satisfactory except for potatoes. Livestock and livestock products found ready markets at good prices, and are becoming increasingly important factors in the returns from the farms.

Engineering.—Reinforced concrete lining was placed on the lower bank and about half the base of the main south side canal for a length of about 1,000 feet, some two miles below Minidoka Dam.

Repairs were made to Jackson Lake Dam in accordance with the recommendations of a board of engineers. Concrete baffles were built below the outlet gates of the dam, the log boom above the dam was strengthened, and a large amount of rock and earth was placed on the lower face of the embankments. This work was in progress at the end of the year.

About 8 miles of drains were completed on the south side pumping division and contract was awarded for building nearly 5 miles additional. These drains were under construction at the close of the fiscal year.

Further investigations were made relative to a proposed enlargement of the canals and pumps of the south side pumping division.

The first 180 stations of the main canal of the gravity extension division were under construction during the year. Fair progress was made with this work. Contracts were awarded for building about 20 miles additional of this canal, and a third reach of canal, embracing some 20 miles, was about ready for advertising.

A contract with the Idaho Power Co. was executed, whereby the company leased surplus storage in American Falls Reservoir for power purposes, and as part compensation therefor, is to supply up to 7,500 kilowatts of power to the United States. The contract is to run for 10 years.

HUNTLEY PROJECT, MONTANA

Economic.—Of the 586 farms under cultivation, 266 were cultivated by owners and 320 by tenants. Good farms were all occupied. Fifteen hundred acres of vacant public, class 5 land were leased to farmers on the project, most of it for grazing purposes.

Farms in classes 1 to 4 can be bought for \$75 to \$250 per acre and farms in class 5 for \$10 to \$50 per acre with few places changing hands. Terms of sale usually require a part payment in cash, with the balance secured by a mortgage. The interest rate for short-time loans ranges from 8 to 10 per cent per annum and for long-time loans from 6 to 7 per cent per annum.

The principal money crops are sugar beets, beans, and wheat. The acreage planted to these crops fluctuates somewhat from year to year, market and weather conditions being the principal causes. In 1929 the acreages planted to beets and beans are both considerably in excess of those of last year, while the wheat acreage is less.

A large number of farmers are members of the Inter-Mountain Beet Growers' Association. The Huntley Project Development Association has a large membership and has been active in matters pertaining to the welfare and progress of the community.

Engineering.—During the year open drains were extended 3,450 feet and 18,370 feet of old waste water ditches were deepened into open drains. A seepage area of several hundred acres developed northwest of Worden owing to the overloading of tile drain No. 6. It is planned to tap this drain near the center and empty it into open drain No. 10-2 which is being deepened.

MILK RIVER PROJECT, MONTANA

Economic.—Of 283 farms operated upon the Malta and Glasgow divisions, 92 were dry farmed and 191 partially irrigated. Tenancy remained practically the same as during 1928.

Fourteen partially improved farms were sold, six being to new settlers who immediately started development of the tracts. Practically no progress was made in the settlement of unimproved lands, except by exchange entrymen. The large landowners are willing to subdivide and dispose of their holdings at reasonable prices, but no interest can be aroused in the improvement of the farms before sale or financial assistance in development. Experienced irrigation farmers with little or no capital can be obtained as new settlers, but if the rapid development necessary for the financial success of the

project is to be secured, some means must be provided to help finance such people in improving the raw lands. Considerable progress has been made in the development of the Zurich irrigation district of the Chinook division during the past year by Winston Bros. Co., who have provided a small fund for the aid of worthy settlers. No source of credit is yet available for use in the development of project lands. The Agricultural Credit Corporation of Minneapolis continues to make livestock loans, but these are confined principally to dry land farmers adjacent to the project. Chattel loans bearing 8 to 10 per cent and with short maturity can be obtained to carry on current operations by those farmers whose credit is well established.

The Utah-Idaho Sugar Co. continued operating the Chinook factory at partial capacity, with a fair output. The sugar beet acreage contracted for 1929 is slightly in excess of the 1928 area, and the prospect of good yields generally is the best in the history of the industry. The Malta creamery promises to be a substantial industry on the project.

Engineering.—Construction work consisted in the removal of slides from the water prism of the St. Mary Canal, strengthening and reconstruction of the canal banks, and the extension of the lateral system of the distribution units to deliver water to lands included within irrigation districts, but not previously supplied from constructed works. This work will be continued for the next two years or until it is possible to utilize the full capacity of the St. Mary Canal, and make delivery to all lands subject to construction repayments under irrigation district contracts.

SUN RIVER PROJECT, MONTANA

Economic.—The Fort Shaw irrigation district operated and maintained the canal system in a satisfactory manner and met promptly all payments due the United States. The principal crop on this division is alfalfa, about half of which is fed on the project and the other half baled and sold. There were only a few changes in land ownership during the year. Of the 183 farms using water, 121 were farmed by owners and 62 by tenants.

On the Greenfields division two-thirds of the cropped area of 30,533 acres was planted to wheat, the average yield being 21 bushels per acre which was sold at an average of 81 cents per bushel, bringing practically no profit to the growers. Of the 335 operating farms, 183 were farmed by tenants and 152 by owners. Owing to the excessive rainfall during the growing season only 7,856 acres of land were irrigated. The irrigation district will levy its first assessment on all of the irrigable lands in 1929 for the purpose of accumulating sufficient funds to cover the cost of operation and maintenance beginning January 1, 1931. The levying of this assessment on all lands whether water is used or not, will have a beneficial influence in

bringing about an increase in crop production and area irrigated. Very few land transfers have been made on the Greenfields division largely for the reason that it has been possible to hold this land without paying State and county taxes or charges to the irrigation district, all of which will be levied for the first time in 1929.

On July 1, 1928, the total delinquent water rental charges amounted to \$18,734. The public notice announcing the rates for water for the season of 1929 provided that the charges for all prior years must be paid before water can be delivered. On July 1, 1929, the unpaid delinquencies had been reduced \$7,000.

There has been a marked increase in the number of sheep on the Greenfields division which are distributed among a large number of farms, in flocks ranging from 50 to more than 300, and the financial returns from these small farm flocks have been very gratifying. There has also been a good increase in the number of hogs. In the spring of 1929 the water users were offered an opportunity to plant seed peas, which under normal conditions would give a profitable return as little money would need to be spent in the purchase of new equipment to plant and harvest the crop. Seven hundred acres were planted and in all cases there is promise of an excellent yield. If present expectations are met, there should be a large increase in the seed-pea acreage in 1930.

Engineering.—On the Fort Shaw division the laterals at the east end of the canal system were enlarged and new structures constructed for the delivery of water to nonapplication private lands.

On the Greenfields division one subsurface drain 6 miles long was completed in October, 1928, for the relief and protection of about 4,000 acres of land in part 2 of the Greenfields division.

Good progress was maintained on the construction of Gibson Dam which will create a reservoir with an initial capacity of 91,000 acre-feet. If necessary this can be increased to 105,000 acre-feet. At the end of June, 1929, this structure was nearly completed and about 10,000 acre-feet of water held in storage for use during July and August. It is planned to defer the grouting of the construction joints in the dam until the spring of 1930.

Work was started on the enlargement of 36 miles of main canal. Two dragline excavators were being used on this work, which will be carried on with Government forces. About 14 miles of new canal will be constructed so as to avoid a treacherous location on the main canal that has been expensive to operate and uncertain as to the quantity of water that could safely be carried. The principal work remaining to be done is the extension of the lateral system to cover an additional area of about 50,000 acres. It is the intention not to start on any of this extension work until the irrigable lands under the present development of 42,000 acres have been fully settled.

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA

Economic.—Of the 632 cultivated farms irrigated and dry farmed on the project, 420 were irrigated in whole or in part. The area irrigated comprised 19,780 acres and the dry-farmed area that could have been irrigated 16,882 acres. In addition, 104 farms comprising 8,700 acres were not farmed owing largely to the fact that they did not have buildings to house the farm workers. Farm owners cultivated 293 farms, or 46 per cent, and tenants 339.

Settlement work was continued. The bureau had a colonization agent in the field for about three months and valuable cooperation was extended by the Northern Pacific and Great Northern Railroads and the Holly Sugar Corporation. Four of the farms on which the Government held options were sold. A few other farms changed hands. Only one farm, however, was sold on which there were no improvements.

The Holly Sugar Corporation continued the operation of the factory at Sidney. Flour mills were operated at Sidney and Fairview. A modern creamery specializing on the manufacture of butter and ice cream was operated continually by the Armour Co. at Sidney. The dairyman's association continued in operation. A bean warehouse with facilities for sorting and cleaning beans was operated at Fairview. The farmers' union gained considerable strength and extended its operations to the purchase of material such as lumber, twine, and other supplies. The union recently established a wholesale oil and gasoline station at Sidney.

The financial record of the irrigation districts continued satisfactory. At the close of the year the Montana district, which comprises about two-thirds of the project area, had met its contract obligations in full both for construction and for operation and maintenance. The North Dakota district owed only \$300 on construction and about \$2,900 on operation and maintenance. All operation and maintenance was financed by funds advanced by the districts.

Adequate credit for the development of unimproved farms is urgently needed. The Federal land bank will make loans in Montana but not in North Dakota. The bank, however, will not loan on unimproved land and consequently is of little assistance to those who most need it. Local money can be had for short periods at 10 per cent interest.

Engineering.—Extensive repairs were made to the deck of the Yellowstone Dam. Construction of the drainage system continued by contract. Three contracts were completed and two additional contracts awarded during the year. About 31 miles of drain were built. The current contracts will virtually complete the drainage works required.

NORTH PLATTE PROJECT, NEBRASKA-WYOMING

Economic.—Of the 2,851 cultivated farms, 1,092 were operated by owners or managers and 1,759 by tenants. Crops were generally good. The total payments for sugar beets for the seven sugar factories of the Great Western and Holly Sugar companies amounted to \$7,735,000.

Since the organization of the North Platte Valley Dairy Development Association, the association has purchased and placed on farms 1,850 dairy cows, about 1,000 being placed during the calendar year 1928. The association has made 250 loans totaling \$150,000, and to date no foreclosures have been necessary. The five cooperative cheese factories produced and sold 1,500,000 pounds of cheese during the year. A new factory was constructed in Gering, having a capacity of 80,000 pounds of milk or 10,000 pounds of butterfat per day. The cheese from the cooperative factories was shipped from the centralizing plant at Gering. The North Platte Valley Cooperative Poultry Marketing Association shipped 17 carloads of turkeys. Two hundred and eighty-five thousand head of sheep and 41,000 head of cattle were fed during the winter of 1928, with profitable results.

The branch of the Union Pacific Railroad to connect the valley with Cheyenne, Wyo., and Denver, Colo., was completed and opened for traffic. A new station providing for division headquarters was constructed at Gering, together with roundhouse and machine-shop facilities. New stations were also constructed by the Chicago, Burlington & Quincy Railroad Co. at Torrington, Wyo., and Minatare, Nebr.

Engineering.—The work of increasing the capacity of the transmission line from the Lingle power plant to Scottsbluff, Nebr., by changing the conductors from No. 6 to No. 1 copper, was completed. The capacity of the Dutch Flats transmission line was increased to 33,000 volts and a new substation constructed. The third 33,000-volt circuit at the Guernsey power plant and the new switching structure at the Lingle power plant were completed. Five miles of the Dutch Flats drain on the interstate division were enlarged and deepened by contract, and 350 linear feet of the Interstate Canal at Mile 92 were lined with concrete to prevent seepage losses.

NEWLANDS PROJECT, NEVADA

Economic.—Of the 681 irrigated farms, 525 were operated in 1928 by owners or managers and 156 by tenants. The area under actual irrigation at the end of the 1928 season was 49,970 acres, representing an increase of 715 acres over the previous year. Water-right applications were approved for 1,059 acres largely covering private lands previously irrigated on a water-rental basis.

Since the assumption of the control of the project by the Truckee-Carson irrigation district on December 31, 1926, eight local improvement districts have been formed under the Nevada irrigation district act for the construction and installation of electrical lines and equipment for rural power distribution. Six per cent bonds issued for six of these districts for which construction work has been completed amounted to a total of \$118,600. Cash paid by landowners in these districts prior to the issuance of bonds amounted to \$7,178 and bonds amounting to \$32,200 were purchased by local individuals. All remaining bonds were purchased by the local bank, purchases being made at par plus accrued interest, indicating a marked confidence in the stability of the project. Bonds amounting to \$37,750 have been sold to local interests and individuals to provide funds for electrical construction work to be done during 1929 in two improvement districts. Distribution of electricity by the irrigation district in the town of Fernley was also accomplished.

The dairy industry continued in a flourishing condition. The quantity of butterfat marketed by project dairymen amounted to 1,400,000 pounds representing an increase of 10 per cent over the previous year, in spite of a net decrease of 500 in the number of cows milked. This decrease was accounted for by the sale of 1,500 cows, principally to California buyers who are constantly seeking tuberculosis-free cows. The average price received for butterfat was 48½ cents per pound at Fallon.

Sheep raising on farms continued to increase with very favorable results and stock feeding showed advancement.

A large portable alfalfa meal mill was completed and operated by the same company which operates an alfalfa mill in Fallon. Practically no surplus hay remained as the result of dairying, feeding, and meal-grinding activities.

Turkey sales amounted to about 55,000 birds for which the average net return to the grower, including all turkey grades, was 35.4 cents per pound. Most of the turkey crop was marketed through the Fallon Turkey Growers Association.

Poultry raising showed marked development. The average production per hen for the year was 12 dozen eggs, the average sale price being 33.18 cents at Fallon.

Numerous landowners received loans from the Federal land bank of Berkeley.

All project payments due the United States were met promptly by the irrigation district and collections by the district from water users were good, with very few delinquents.

CARLSBAD PROJECT, NEW MEXICO

Economic.—Of the 425 cultivated farms 154 were operated by tenants and 271 by owners or managers. Practically the entire irrigable acreage was utilized. A few farms changed hands, sales being confined almost entirely to local residents. Prices of farm lands ranged from \$150 to \$300 per acre. Crop yields were somewhat lower than in 1927 owing to excessive rains. Financial conditions, however, remained stable. Bank deposits were about \$1,000,000.

Engineering.—Appropriations by Congress to increase storage at Avalon Reservoir were made contingent on the approval of the Director of the Geological Survey as to the ability of the reservoir to hold water without undue leakage. Geological investigations were in progress during June, 1929.

RIO GRANDE PROJECT, NEW MEXICO-TEXAS

Economic.—Practically all of the project is in private ownership and is approximately 95 per cent under cultivation. Of the 4,728 farms 3,084, or 66 per cent, were operated in 1928 by owners and 1,644 by tenants. Only a few large tracts are being developed in areas of several hundred acres, and although several farms exceed 160 acres, the typical farm is probably from 60 to 120 acres. However, the mean area of all tracts is less than 20 acres in the Texas district and about 40 acres in the New Mexico district. Fifty to 60 per cent of the total number of tracts is held in areas of less than 20 acres, but these tracts comprise only 10 to 15 per cent of the entire project area. This is due to the large number of small tracts held for homes by those who work on farms, or suburban homes of people having business or work in the city and whose occupation is other than farming. These small tracts are usually intensively cultivated for home garden and orchard purposes. Many owners of small tracts lease other land which accounts for some of the tenant-operated farms. Many of the tenants are also newcomers, who either have insufficient means to buy and farm land, or else prefer to rent for a year or two to thoroughly try out local farming conditions before contracting to purchase. Most of the leased land is owned by project residents. No farms have been abandoned; mortgage foreclosures are unusual and farmer ownership of the land is increasing, with already a good percentage of the land being farmed by owners. Some large tracts are being sold in smaller farms and some farms near the city are being subdivided for homes. Farm loans by the Federal land banks are made on project lands. Dairying showed a decline, owing probably to the high price of feed and the greater profits from the high price of cotton. There is wide opportunity and urgent need for improvement and development in livestock raising and diversified farming.

The only new industries on the project pertaining directly to farming were additional cotton gins, compresses, and oil mills. There are now 34 gins, 4 compresses, and 6 oil mills, the largest of which is the Globe Mills plant at El Paso. El Paso is experiencing a wave of industrial development which will broaden the local market for farm produce. This development has followed the installation of oil and gas pipe lines to El Paso from New Mexico-Texas oil fields. Power transmission and distribution lines now reach almost from one end of the project to the other.

Cooperative producing, buying, and selling associations include the Southwest Irrigated Cotton Growers Association, Elephant Butte Alfalfa Growers Association, Mesilla Valley Fruit Association, El Paso Valley Bartlett Pear Association, El Paso Egg Producers Association, and Elephant Butte Chili Growers Association. The Southwest Irrigated Cotton Growers Association is a strong organization with large membership and provides crop financing through intermediate credit banks as well as marketing. The cantaloupe crop is handled entirely through eastern distributing concerns. The crop is very well stabilized both as to production and marketing. The distributors contract the acreage in advance and limit this to what they have learned from past experience they can handle. The crop comes in between the Salt River Valley and Colorado crops and is handled by the same packers and shippers progressing from one locality to the other as the crops come on. The Rio Grande Valley Dairy Association, which became very strong and once boasted a record for per cent of returns to the producers, after building up a large distributing organization and market fell into private hands. This business, together with the other largest milk distributing plant in El Paso and a local ice-cream factory, has been taken over by a large dairy corporation and is being operated by a local holding company under the name of Midwest Dairies (Inc.). Several of the cotton plants are wholly or partly farmer-owned, some of which operate on a profit-sharing basis. The Dona Ana County Farm Bureau with several "locals" functions in the New Mexico division of the project, and the El Paso County Farm Bureau with its locals functions in the Texas division. The New Mexico Agricultural College and Experiment Station are located near Las Cruces and render a great deal of assistance to project farmers in carrying on investigations and giving advice.

Economic conditions on the project have been very satisfactory with a general air of progress and prosperity. This can be attributed to the prevailing good price of cotton combined with the high and certain yield assured by an adequate water supply and absence of pests. Bank deposits have been increasing, finances are good, and farm improvements are being made quite generally. There are

practically no delinquencies in payments to the Government. Roads are being continually improved and new ones built. Many new and very fine public grade and high schools have been constructed throughout the project. Many new and attractive farm homes have been built and these, equipped with electricity and telephone communication and accessible by improved roads, are giving the project rural life greater attractions. Social intercourse is broadened by the farm bureau meetings, rural clubs, churches, and community centers, and many social gatherings in homes.

Engineering.—During the year work progressed on the extension or improvement of drainage facilities for about 6,000 acres. Construction of the Riverside Canal continued under the provision of the adjustment act of 1925. The middle third of the canal was practically completed during the year, making this feature about 65 per cent finished. Four and seven-tenths miles of drains and 4.7 miles of irrigation canals were constructed during the year.

The most urgent work remaining is the extension or improvement of drainage facilities for the rest of the irrigable area, or for about 9,000 acres scattered throughout the project in many areas of varying extent, usually a few hundred acres each. This will require limited extensions to existing drains and construction of a number of short branch drains. Some extension and improvements to the irrigation distribution system are desirable. Financing of the additional work by increase of contract liabilities or contribution of funds is under consideration by the irrigation districts.

UMATILLA PROJECT, OREGON

Economic.—East division: Of the original 17,300 acres of irrigable land in this division, approximately 11,000 acres remain subject to water assessments by the Hermiston irrigation district. Of these 11,000 acres, 8,000 acres paid operation and maintenance charges during the year and 7,000 acres were being cropped. Dairying and poultry raising are the only enterprises that have shown a profit to the farmer. A shift from alfalfa hay to pasture is steadily going on and during the past year 600 acres of land have been changed from alfalfa hay to pasture. The present trend of the farmers' operations toward dairying and poultry raising, would indicate that the status of the project within the next five years would show a total irrigated area of about 6,500 acres, of which 4,875 acres of light sandy soils would be given to poultry raising, and 1,625 acres suited to the production of good pasture grasses, to dairying.

West division: Of the 168 cultivated farms in this division, 102 were operated in 1928 by owners and 66 by tenants. The irrigated acreage has fallen off from 4,400 acres irrigated in 1926 to 3,900 in 1929. There is no new development. About 600 acres have become

alkalied in the Boardman district, and about 450 acres less are paying operation and maintenance charges than paid last year.

VALE PROJECT, OREGON

Economic.—The Vale-Owyhee Government Projects Land Settlement Association was organized in March, 1929, for the purpose of securing settlers for the lands to be irrigated. This association has held regular monthly meetings since its organization and has carried on a vigorous advertising campaign through the medium of various newspapers, commercial clubs, and chambers of commerce, and through the issue, by the association, of a descriptive booklet. As a result, many inquiries have been received, and many prospective settlers have visited the project and inspected the lands in the vicinity of Harper and Little Valley, for which water will be available in 1930. Approximately 1,000 acres of this land have been sold by the owners at the appraised values. In addition, the owners of about 270 acres have signified their intention of settling on and farming their own lands. The owners of some 400 acres are undecided whether they will sell their holdings or develop them for their own use.

Engineering.—The construction of approximately 19 miles of the Vale main canal was completed. An additional $2\frac{1}{2}$ miles, including a diversion dam and 8,470 feet of concrete lined tunnels, will be completed in January, 1930. Contracts have been awarded for the construction of $16\frac{1}{2}$ miles more of main canal and 45 miles of laterals and structures for the Harper and Little Valley unit.

The field work in connection with advertising the construction of the lateral system for West Bully Creek bench was completed. Work was also under way preparatory to advertising the construction of Bully Creek siphon and 6 miles of main canal east of Bully Creek.

About 19 miles of drains were constructed by government forces during the year, which completed the Warm Springs irrigation district's drainage system, comprising 56.85 miles of open drains.

KLAMATH PROJECT, OREGON-CALIFORNIA

Economic.—There was a slight increase in the number of tenants during 1928, but a decrease in the percentage of tenancy of the 624 cultivated farms. Within the main and Tule Lake divisions 117 farms were cultivated by tenants and 507 by owners. The chief cause of tenancy is that lands are held by nonresident owners and large land owners do not wish to sell at a price sufficiently low to justify purchasing.

On the 208 units of public land totaling 12,000 acres in the Tule Lake division which have been opened to entry during the last few years, all units have been settled and improvements to the amount

of \$108,000 were effected during the year. Public notice dated February 6, 1929, opened to entry 28 farm units of Tule Lake land totaling 1,887 acres. The number of qualified applicants was 77.

The Southern Pacific Co. was engaged in constructing a railroad about 100 miles in length from Klamath Falls southeasterly to Alturas. This railroad will traverse the irrigable lands of the valley including Tule Lake.

An area of privately owned land sufficient to make about 200 fair-sized farms was not cultivated to advantage during 1928, due mainly to land being held in too large ownerships or being owned by absentees. Much of the indifferently cultivated land is within the Langell Valley, Horsefly, and Shasta View irrigation districts. Some of the land is cleared and fenced, but only a few farms have permanent improvements of much value.

The various districts are making a greater effort to collect delinquent taxes. The Enterprise irrigation district has one contested suit in progress. The Federal land bank of Spokane forecloses against those borrowers who are delinquent either in payment of taxes or in payments to the bank.

The Malin cheese factory is the only cooperative marketing association vigorously functioning on the project. The Western Cattle Marketing Association is a cooperative organization which operates in Klamath County, and last year did a business of about \$500,000. A poultry growers' association with 20,000 hens is in operation. A potato growers' association is functioning, but its activities are confined mainly to standardization, so that only first-class potatoes will be shipped under the brand of the association. A hay growers' association has been organized by Tule Lake settlers.

Engineering.—Work was completed on the main drain, which provides an outlet for the lower lands in the Langell Valley division. On the Tule Lake division distribution and drainage works were extended to serve an additional area of about 2,000 acres. Flood protection works consisting of over 3 miles of dikes were constructed. Enlargement of the Lost River diversion channel was started April 1, 1929, and on June 30 about 1 mile of canal had been enlarged and contracts awarded for the enlargement of the headworks structure and the construction or reconstruction of seven minor structures. On the reconstruction and extension of the drainage system for the lands in the Klamath irrigation district, contract was awarded for the construction of the No. 1 drain crossing under the Lost River diversion channel.

OWYHEE PROJECT, OREGON-IDAHO

Engineering.—During the year the Owyhee railroad, 24 miles in length from Dunaway to Owyhee, Oreg., was completed and put into operation; a transmission line from the Ontario-Nyssa substation to

the construction substation at the dam, 19 miles long, and a telephone line from Adrian to the dam, 13 miles, were finished, and construction of the 405-foot Owyhee Dam was begun.

Work on the dam was started on July 14, 1928, by the General Construction Co. and actively prosecuted preparatory to diverting the river. The diversion and spillway tunnel and shaft were excavated and partially lined, abutments and keyways were excavated, and equipment was installed for excavating the foundations as soon as the river is diverted. This contract was 14 per cent completed at the end of the fiscal year.

To carry out the construction program on the project as planned so that water will be available in 1934, annual appropriations of \$3,000,000 will be required between 1931 and 1934 in addition to the \$6,000,000 appropriated prior to that time.

BELLE FOURCHE PROJECT, SOUTH DAKOTA

Economic.—Of the 876 irrigated farms, 331 were operated in 1928 by owners or managers and 545 by tenants. Lack of adequate housing facilities on the farms available for settlement continues to be the principal economic problem. Prospective tenants have come to the project in increasing numbers, but left because of the lack of buildings and improvements. Seventy-five newcomers have located on the project in recent years, but there are still some 400 farms that need resident operators. It is obvious that settlement must be preceded by building construction and other preparations for occupancy. The unoccupied farms are owned largely by nonresidents who have neither the capital nor inclination to advance funds for improvements because their present investment in many cases is already more than the market value of the farm. No money is available for real-estate loans, and short-time bank loans are made only on productive livestock or for financing the sugar-beet crop. These loans are generally at 10 per cent.

The sugar factory at Belle Fourche is well supplied with beets, having a contributing area of 10,500 acres in 1928, of which two-thirds were grown on the project. It is estimated that this acreage will increase 10 per cent in 1929 and under normal conditions will give the present factory more beets than it can conveniently handle. Cucumbers for pickles have been a very satisfactory cash crop, bringing in about \$100 per acre and grown in limited areas of 1 to 3 acres on about 15 per cent of the project farms. The sheep and dairy industries are making progress and show a gain of 157 cows and 16,000 head of sheep in the last year. The Minneapolis Credit Corporation will finance these industries up to \$1,000 per individual. A number of project farmers have availed themselves of this credit facility.

Irrigation district operation under the new contract of October 4, 1927, has been very satisfactory and all payments due the United States have been met promptly. About 10 per cent of project farms are delinquent in water payments, but this is taken care of by the district under deficiency assessments. A movement is under way for the taking of tax titles by the county and irrigation district on all lands that are hopelessly in arrears, and it is expected that clearing up of titles in this way will act as an impetus to farm sales and settlement.

Engineering.—Drainage construction began early in 1928 and continued through the fiscal year, at which time 43.3 miles of open drains had been completed, representing about 30 per cent of the project's drainage needs. About 10,000 acres are affected by seepage and to reclaim these areas and protect adjacent lands will require a comprehensive drainage system of about 145 miles. This construction is to be distributed over five years, after which the irrigation district is to take charge of the project under its contract with the United States.

The replacement of the Deer Creek siphon was completed in December, 1928, and of the Lang siphon in May, 1929. A contract for the replacement of Indian Creek and Horse Creek flumes on the north canal was let on June 4, 1929, and the contractor began operations just before the close of the fiscal year.

SALT LAKE BASIN PROJECT, UTAH

Engineering.—Construction work has continued on the first unit of the project, comprising the Echo Dam and the relocation of the Lincoln Highway and Union Pacific Railroad around the reservoir.

This project, when completed, will furnish supplemental water for irrigation in the lower Weber, Provo, Salt Lake, and Ogden Valleys. Water will be delivered to the various canal companies holding about 60,000 acres in Weber and Ogden Valleys and 20,000 acres in the Provo and Salt Lake Valleys. No reservoir stock was disposed of during the year by the Weber River Water Users' Association, 20 per cent remaining unsold.

Surveys for the Weber-Provo diversion canal were completed and work was started on the preparation of drawings and specifications for the advertisement of this work to be done under contract. Contracts for the purchase of the right of way were signed with 44 of the land owners. Contracts remain to be accomplished with five of the land owners.

The work of the Utah Construction Co. for the construction of the 5 miles of highway and railroad relocation was completed on April 30, 1929, the final contract payment for this work being \$440,144.41.

Work on the dam was continued by A. Guthrie & Co. (Inc.), and was 40 per cent completed at the end of the fiscal year.

The diversion tunnel was completed and the uncompleted stilling basin flumed making it possible to divert the river water on October 29, 1928. In the embankment section of the dam 512,650 cubic yards of earth and rock fill had been placed.

STRAWBERRY VALLEY PROJECT, UTAH

Economic.—Of the 38,850.52 acres of cropped area under the project, all but a few acres are now under the direct supervision of the owners. Two hundred car loads of onions will be shipped from the project this fall. The prospect for good yields of sugar beets is the best in years. The acreage seems to decrease a little each year. The acreage and yield of alfalfa and grains will be about the same as last year. The fruit crop is fair, and more than 1,000 acres are planted to canning crops this year. More than 25,000 sheep are now owned on the project. The water users are looking forward to grazing their own grazing lands in 1931. The poultry industry is increasing steadily. It is estimated that 125,000 laying leghorn hens will be on the project this fall. This will mean about 225 cases per week going to the eastern market through the Utah Poultry Association of the famous Utah "Milk White" eggs. An ice cream company has established a creamery and a project and county movement is under way to join a cooperative marketing association of creamery products. One thousand new cows have been brought to the project this year besides the normal natural increase.

The project is in need of amortized credit at a reasonable rate of interest to stock the farms with more and better livestock and to build more and better homes.

OKANOGAN PROJECT, WASHINGTON

Economic.—No new lands were brought under cultivation during the fiscal year. Under contract with the United States dated November 24, 1928, the Okanogan irrigation district assumed the operation of the project on January 1, 1929. Under a proviso of this contract the district has canceled the water right on approximately 1,000 acres of subscribed right lands for nonpayment of irrigation assessments. This process of cancellation is to continue until the project has been reduced to 3,700 acres. Most of the lands canceled are either raw lands or those which have demonstrated their inability to make a reasonable return on the investment.

Business conditions were very good during the past year. Bank deposits increased approximately \$140,000. The apple crop, although only 50 to 60 per cent of normal, was expected to bring excellent returns.

YAKIMA PROJECT, WASHINGTON

Economic.—All farms of such quality as to be capable of profitable farming are being cultivated on the Sunnyside and Tieton divisions. Of the 4,847 irrigated farms on the project, 3,370 were operated by owners and 1,477 by tenants. Water rights on some of the poorest land of the Tieton division are being purchased and transferred by the owners of highly producing orchards to supplement their water supply. This is materially improving conditions on that division.

There was an increase in the cold-storage and packing plants and in the fruit and vegetable processing and canning plants. The apple-growing area on the Sunnyside has fallen off 32.7 per cent since 1920, owing to the elimination of unsuitable lands. Pasture lands have increased to take care of this, with some added cultivated crops and grains. Livestock, principally dairy cows, increased 24 per cent. The project is well covered by strong and successful cooperative associations handling fruit and vegetable crops and dairy products.

Of the five leading crops grown on the Sunnyside division, accounting for 74 to 84 per cent of the total crop value in the past 10 years, alfalfa hay has been declining, while the value of pastures has doubled. Apples and pears are becoming more stabilized on areas best suited to their production. The recent increase of 11 per cent in the dairy herds during the last year is encouraging.

On the Tieton division, fruits now account for 86.7 per cent of the crop value, compared with 35.5 per cent 10 years previous.

Engineering.—Construction operations were limited to digging test pits at Cle Elum Reservoir, repair of the spillway channel at Rimrock Dam, and replacement of pipe lines and structures on the Sunnyside and Tieton divisions. Construction work remaining is the building of the permanent dam at Cle Elum Reservoir, the construction of the irrigation systems for the Mabton district on the Sunnyside division and the systems for the Roza, Moxee, and Kennewick divisions.

Kittitas division.—The problem of settlement is not expected to become a live issue on the Kittitas division until water is available for delivery. However, printed matter is ready for distribution and the Ellensburg Chamber of Commerce is answering inquiries concerning opportunities on the project. Clearing of timber and sagebrush from part of the privately owned lands was continued and the Kittitas Land Settlement Co. was organized to aid settlers in clearing their lands and starting farm operations. More than \$60,000 capital stock has been sold, chiefly in the city of Ellensburg. This company has purchased two tracts of cut-over timberlands, contracted the clearing of one tract, and is clearing the other one themselves. They have spent \$3,000 for equipment and are doing

considerable experimental work in finding the best and cheapest way to clear the lands. The Northern Pacific Railway Co., through its subsidiary, the Northwestern Improvement Co., is engaged in a comprehensive plan for the improvement and subdivision of certain railway lands in the vicinity of Cle Elum. With the aid of the Kittitas Land Settlement Co., the Northwestern Improvement Co. has sold about 500 acres of this land at the appraised valuation.

As the main body of land in the Kittitas division practically surrounds an area which has been successfully farmed under private irrigation systems for a long period of years, the matter of providing financial and other assistance to project settlers is largely one of expansion of existing facilities. The present Kittitas County banks will serve as one source of credit, and farm loans from the local organization of the Federal land bank will undoubtedly be available when water is delivered. The Farmers Loan Corporation has increased its capital from \$50,000 to \$125,000. This corporation was organized to assist farmers in the purchase of livestock. A savings and loan association has increased its capital of \$100,000 a year ago, to \$150,000. The Extension Service and the Kittitas Farm Bureau are cooperating in a program of assistance to farmers along the lines of agricultural economics, soil fertility, irrigation and drainage. The Kittitas County Dairymen's Association, with a capital of \$50,000, has been operating successfully since 1924.

Engineering.—Final location surveys were made for the North Branch laterals between stations 841 and 1453 and for the wasteways under the North Branch Canal. Location of the turbine, gravity, and pump laterals below the Wippel pumping plant was in progress.

Construction of the main canal (except Tucker and Cle Elum Creek siphons and Northern Pacific and Milwaukee tunnels), clearing the reservoir site above Easton diversion dam, and testing of the Yakima River tunnel site were completed. Work was in progress on the construction of the Easton Dam, laterals for 5,500 acres of irrigable land under the main canal, the South Branch Canal and Division 1 (about 11 miles) of the North Branch Canal. Award of contracts for the construction of laterals for 8,300 acres of irrigable land under the South Branch Canal was made in June, but actual construction work had not commenced. Work by Government forces included the manufacture of lock-joint concrete pipe units and minor repairs on the main canal.

Bids were opened on May 18, 22, and 25 covering the excavation of laterals for 7,700 acres of irrigable land under the North Branch Canal, but award had not been made at the end of the fiscal year. Preparations were being made to advertise for bids for the construction of Division 2 (about 20 miles) of the North Branch Canal, and laterals for about 22,300 acres of irrigable land under the North Branch Canal to Vantage Ferry Road.

RIVERTON PROJECT, WYOMING

Economic.—Of the 14 irrigated farms on the project, 12 were operated by owners or managers and 2 by tenants. About 100 farms in private ownership are unoccupied and unimproved and are priced at from \$10 to \$15 per acre, usually on reasonable terms. Crop conditions on June 30 were much better than in any previous year and there is in consequence a greater feeling of optimism. Long-time credits at not to exceed 5 per cent interest are urgently needed. Short-time credits at 10 per cent are available on good security.

Engineering.—Construction on the Pilot Canal and lateral system was in active progress throughout the fiscal year. Canal excavation was completed to about Mile 21 and the excavation of laterals and the building of canal and lateral structures above that point were well under way. On the Pavillion division drain "A" was practically completed. Work will be continued on the Pilot division during 1930. An additional appropriation of \$250,000 will be needed to complete this division in 1931.

SHOSHONE PROJECT, WYOMING

Economic.—Of the 860 farms under cultivation, 519 were operated in 1928 by owners or managers and 341 by tenants. One-half of the 26 units brought under cultivation for the first time were on the Willwood division. On the Garland and Frannie divisions there has been a steady increase in the irrigated acreage owing chiefly to the drainage of seeped areas. The irrigated area on the new Willwood division in June, 1929, was 2,335 acres.

In order that good farms might be available and settlement of the Willwood division completed at the earliest possible date, part 3 was opened to entry on June 10, 1929. Development of this division has been fairly satisfactory, although the settlers must have more stock and better improvements. Few of the settlers are in a position to finance this very necessary type of agriculture.

On the Garland division where the settlers have title to the land, the State of Wyoming has been very helpful in loaning money at 5 per cent interest amortized in 30 years. During the year about 20 such loans were made. If some similar agency could loan deserving settlers on the Frannie and Willwood divisions money for the purchase of livestock and farm improvements, the return of the investment by the United States for irrigation works would be much surer and faster.

Carload shipments from the project were 1,828, or 655 less than in 1927. The decrease is due principally to shipping a more finished product to market. There were 87 cars of stock, 7 of dressed turkeys and poultry, 4 of honey, and 9 of wool shipped out in 1928. Butterfat production was 167,390 pounds.

New industries consisted of an oil refinery at Cody and a canning factory at Cowley. The refinery has only recently been in operation. In 1928 the output of the canning factory was 364,000 cans. The Mountain States Power Co. constructed a transmission line from Lovell to Worland. The power load has increased gradually and in June, 1929, it had reached approximately 500,000 kilowatt-hours.

Engineering.—On the Frannie and Garland divisions 17½ miles of drains were constructed, of which 3½ miles were closed. As the Willwood division lands were entered the necessary small lateral structures were installed.

SECONDARY INVESTIGATIONS

Funds for the investigation of prospective projects and kindred work are derived from appropriations by Congress, from contributions by States and other organizations for expenditure by the Bureau of Reclamation, and by direct payment by States and other organizations to personnel operating under the direction of or in cooperation with the bureau. Additional data become available for use by the bureau as the result of work by other agencies wholly independent of the bureau's activities, involving the expenditures of large amounts, which are not reported to the bureau. Federal funds for work done during the past fiscal year, as hereafter described, were available from the reclamation fund by the appropriation acts of January 12, 1927; March 7, 1928; and March 4, 1929. Of \$104,133 disbursed by the bureau for this purpose during the past fiscal year, \$87,806 was provided by the United States. Details of cost will be found in the financial section.

IDAHO

Twin Springs Reservoir.—By agreement with the board of control of the Boise project, dated May 10, 1929, and at the sole expense of the board of control, designs and estimates are in course of preparation for a storage reservoir of 170,000 acre-feet capacity, located on North Fork of Boise River immediately above its junction with the South Fork. The head created by the storage dam and the regulated flow that such storage will permit are favorable to power production in large amounts and available at nearly all times. It is also expected to make studies of an alternative plan of enlarging Arrowrock Reservoir in lieu of Twin Springs storage.

NEVADA

Truckee River Investigations.—The work undertaken in 1927 was completed with the issuance of a report in April, 1929, summarizing all available data on upstream reservoir sites with designs and estimates on the more favorable, together with studies on their utiliza-

tion for the irrigation of lands in the Reno Valley and on the Newlands project. The field work described includes surveys of the Prosser, Stampede Valley, Martis Valley, and Little Truckee Canyon reservoir sites; resurveys of parts of Donner, Independence and Webber Lakes, and of Squaw Valley and Henness Pass reservoir sites; geological examinations of the Stampede Valley, Prosser, Little Truckee Canyon, and Martis Valley sites; diamond drilling at the Prosser, Stampede Valley, and Little Truckee Canyon sites; test pits at a large number of the sites.

The most favorable site for large storage capacity was found to be the Stampede Valley site, where physical conditions are suited to a maximum capacity of 150,000 acre-feet, at an estimated cost of \$2,959,000, with the annual yield of water dependent on feed canals that might be built to divert water from Prosser Creek, and on arrangements for joint operation of Lake Tahoe. For intermediate capacity the Little Truckee Canyon site appears most favorable and is physically limited to a capacity of 42,000 acre-feet. Lesser capacities can best be provided by Donner and Independence Lakes.

Utilization studies indicate a moderate average acre cost for a supplemental supply for lands now irrigated. Additional storage and other works required in the irrigation of new lands with the additional cost charged to such lands results in an acre cost too high for present farming conditions. The report recommends consideration by interested parties of the increased utilization of Donner and Independence lakes, or in the alternative, the construction of Little Truckee Canyon or Stampede Valley Reservoir, with a capacity of 42,000 acre-feet.

Carson River investigations.—All available data on reservoir sites in the headwaters of the Carson River were assembled and surveys made of a number of sites not heretofore considered. At the close of the year studies of relative desirability and of water supply were under way with completion of report anticipated early in the coming year. The lack of definition of water rights in this basin combined with the uncertain ultimate development of some projects already undertaken, will probably preclude conclusive results.

NEW MEXICO

Middle Rio Grande Valley investigations.—Field work consisting of stream flow measurements, records of ground water fluctuation in the valley, and observation of soil and water evaporation at the Los Gregos station near Albuquerque were continued to October, 1928, when the station was taken over for operation by representatives of the University of New Mexico. Completion of the final report is awaiting availability of further stream flow data being obtained by the State engineer and may be expected in the course of the next fiscal year.

UTAH

Great Salt Lake Basin investigations.—Investigation of irrigation possibilities in Utah are conducted in cooperation with the Utah Water Storage Commission, under the contract of January 3, 1922, and various supplements thereto, in particular the contracts of June 24, 1927, and May, 1929.

Cache Valley investigations.—A report on further irrigation development of this valley was completed and issued in August, 1928. The most favorable reservoir sites found were the Hyrum and Porcupine sites on Little Bear River. Hyrum Reservoir, with a capacity of 20,000 acre-feet, is located at the town of Hyrum. Utilization of the site contemplates one canal northerly to the Utah-Idaho State line, of which the part from Logan River to Smithfield would be an enlargement of the Logan and Northern Canal, while the balance would be new canal with capacities up to 150 second-feet. Another canal, entirely new and with a maximum capacity of 85 second-feet, would lead westerly from the reservoir to Mendon. The total cost of reservoir and main canals is estimated at \$1,600,000 and the area benefited would be 26,000 acres, practically all of which is under irrigation with an inadequate supply.

The Porcupine reservoir site is located 4 miles above Avon on East Fork and with a capacity of 5,500 acre-feet would provide a supplemental water supply for 5,125 acres now receiving a partial supply from constructed canals in the Avon and Paradise vicinity, at an average acre cost of \$155. By increasing the capacity to 15,500 acre-feet, the benefited area could be increased to 9,085 acres, of which 3,770 acres would be lands requiring canals as well as storage and located principally south of Hyrum and south of Little Bear River. The acre costs for this plan would vary from \$65 to \$338 per acre with an average of \$209 per acre. The costs with either plan are considered excessive for the prevailing type of agriculture.

The Utah Water Storage Commission, by resolution dated March 27, 1929, recommended that preference in construction be extended the Hyrum Reservoir project. At the close of the year final location of the canals was practically complete, and an extensive investigation of construction materials for the dam was under way.

Provo River investigations.—Plans were laid during the year for further studies of plans along lines that would eliminate the development of new lands for which the cost of storage and canal system, and particularly the latter, was too high for feasibility under present conditions. In the new plans storage waters would be furnished Salt Lake City for municipal purposes in lieu of developing new lands. Further consideration was also given to a reduction in the cost for relocation of the existing railroad in the Deer Creek Reservoir site.

A geological examination of the Deer Creek site was made by a consulting geologist, who reported favorable conditions at dam sites numbered 2 and 8.

Blanding investigations.—A report on this project was made in January, 1929. An area of 3,000 acres now receives a flood-water supply, ordinarily lasting through June, from Johnson and Recapture Creeks on the south slope of the Abajo Mountains. A tunnel 1 mile long through the same mountains, with 8,000 feet of feed canals, would permit the diversion of surplus waters from Indian Creek on the north side of the same mountains. From the 1-year record of flow, the amount so divertible would average from 2,500–3,000 acre-feet annually, and its occurrence would coincide with the present available flow. As such additional supply would not alleviate the existing late season shortage on lands now irrigated, and storage sites are not available, it was concluded that the effect of such additional diversion would merely be one of increasing the area receiving an unsatisfactory water supply. The estimated construction cost of \$48 per acre-foot of such additional flood supply is high for the prevailing type of agriculture, which is primarily the growth of forage for stock feeding.

Moon Lake investigations.—Additional data were obtained bearing on the present utilization of stream flow, particularly as to irrigated areas, irrigible areas, and canal systems. Late in 1928, eight test pits with a combined depth of 125 feet were dug at tentative dam-site locations by the Dry Gulch Irrigation Co. under direction of bureau engineers, and several percolation tests were made by means of water pumped into shallow pits adjacent to high-cut banks. Following preliminary studies of dam design, arrangements were under way at the close of the year for additional drilling to develop foundation conditions where solid rock may apparently be utilized for spillway and outlet works.

WASHINGTON

Yakima project extensions.—An investigation was made of areas lying above the proposed canal for the Roza division, to ascertain the lands that might be irrigated with pumping lifts of 100 to 250 feet, such investigation including mapping, a land classification, and estimates of cost of distribution works. A brief study was also made of alternative power sites along the Roza main canal location and on Yakima River, to ascertain the most favorable source of power supply for pumping on the Roza and Kennewick divisions. At the Cle Elum Reservoir site, test pits were started to determine substructural conditions in the immediate vicinity of the dam site.

WYOMING

Pursuant to joint resolution of Congress, approved June 7, 1924 (43 Stat. 668), a contract with the State of Wyoming, dated May 1, 1929, provides for equal financing by the State and the United States, of an investigation of the Alcova-Casper and Saratoga projects, and, in the event of adequate funds, such other projects as may later be agreed upon, the procedure in such investigations to be in accordance with plans agreed upon in the course of the work. The maximum expenditure is limited to \$25,000 for each party.

Alcova-Casper project.—A geological examination has been made of the Alcova Canyon diversion dam site and of the Seminole Canyon dam site, under the direction of the United States Geological Survey. A report is anticipated at an early date, after which plans will be made for such drilling as may prove desirable to determine the feasibility and cost of constructing dams at these sites. At the close of the year a survey party was engaged upon flagging land corners to facilitate a detailed land classification, to be made for determination of the irrigable area from the standpoints of soil character and depth, topography, and drainage.

Very respectfully,

ELWOOD MEAD,
Commissioner.

TO HON. SECRETARY OF THE INTERIOR.

TABLES

RECLAMATION TABLE 1.—*Consolidated financial statement, June 30, 1929*

		DEBIT SIDE	
Construction account:			
Primary projects—			
Cost of irrigation works—			
Original construction.....	\$174,162,413.56		
Supplemental construction.....	10,360,934.28		
Value of works taken over.....	2,062,994.39		
Total construction cost.....		\$186,586,342.23	
Operation and maintenance prior to public notice (net).....	2,677,169.30		
Operation and maintenance deficits and arrearages funded with construction.....	4,529,159.18		
Penalties on water-right charges funded with construction.....	1,198,857.48		
		8,405,185.96	
Less—		194,991,528.19	
Abandoned works, nonreimbursable cost and charge-offs.....	16,546,277.38		
Construction revenues.....	5,333,678.29		
Contributed funds.....	1,320,870.80		
		23,200,826.47	
Balance repayable.....			\$171,790,701.72
Yuma auxiliary project—			
Cost of irrigation works.....		875,394.43	
Less: Construction revenues.....		296.87	
			875,097.56
Secondary projects and general investigations:			
Cost of surveys and investigations.....	2,891,028.04		
Less: Contributed funds.....	546,737.93		
			2,344,290.11
Plant and equipment.....			856,482.32
Materials and supplies.....			610,906.91
Accounts receivable:			
Current accounts due.....	1,915,450.20		
Deferred accounts not due.....	152,754,416.69		
			154,669,866.89
Prepaid civil-service retirement fund.....			2,340.33
General office expense undistributed.....			609,854.56
Undistributed clearing cost accounts.....			56,140.54
Unadjusted debits: Disbursement vouchers in transit.....			7,466.65
Cash:			
Balance on hand—			
Reclamation fund.....	7,887,967.27		
Yuma auxiliary fund.....	159,061.18		
Special funds.....	123,160.30		
		8,170,188.75	
Cash in special deposit and in transit.....		47,222.83	
			8,217,411.58
Total debits.....			340,040,559.17
		CREDIT SIDE	
Security for repayment of cost of irrigation works:			
Contracted construction repayments.....	186,529,061.84		
Yuma auxiliary contracted repayments.....	645,502.33		
			187,174,564.17
Current accounts payable.....			1,340,884.19
Deferred and contingent obligations.....			555,366.49
Reserves and undistributed profits.....			6,281,425.73
Unadjusted credits: Collection vouchers in transit.....			3,846.95
Operation and maintenance results, surplus.....			430,249.56
			37

RECLAMATION TABLE 1.—*Consolidated financial statement, June 30, 1929—Con.*

Government aid for reclamation of arid lands:		
Reclamation fund.....		\$145,714,305.92
Special funds—		
Increase of compensation.....		2,797,960.33
Rio Grande Dam.....		1,000,000.00
Wind River Indian (Riverton).....		359,176.04
Judgments, Court of Claims.....		600,008.24
Drainage and cut-over lands.....		99,815.08
General investigations, 1923-Dec. 31, 1924.....		266,352.66
Arid, semiarid, swamp, and cut-over timberlands.....		45,000.00
Columbia Basin irrigation project.....		25,000.00
Colorado River levee system.....		200,000.00
Total.....		151,107,618.27
Advances to reclamation fund (bond loan).....	\$20,000,000.00	
Less: Amount repaid.....	9,000,000.00	
		11,000,000.00
		162,107,618.27
Less: Nonreimbursable appropriation, Rio Grande Dam.....		1,000,000.00
		161,107,618.27
Less: Impairment of funds—		
Abandoned works.....	1,358,181.04	
Nonreimbursable cost.....	478,933.72	
Operation and maintenance cost uncollectible.....	453,290.99	
Charge-offs, act of May 25, 1926.....	14,562,990.44	
		16,853,396.19
		\$144,254,222.08
Total credits.....		340,040,559.17

RECLAMATION TABLE 2.—*Available funds, expenditures, and balances, fiscal year 1929*

Items	Funds					
	Reclamation	Yuma auxiliary	General investigations	Arid, semiarid, swamp, and cut-over timber lands	Columbia Basin irrigation project	Colorado River levee system
Balance on hand July 1, 1928.....	\$9,208,247.50	\$128,761.83	\$8,647.34	\$2,876.66	\$14,054.08	\$74,447.46
Receipts:						
Proceeds from sale of public lands.....	647,236.95					
Proceeds from sale of town lots.....	¹ 157.46					
Proceeds from oil leasing act.....	1,852,785.03					
Proceeds from potassium royalties.....	12,517.57					
Proceeds from Federal power licenses.....	17,201.18					
From project collections.....	7,321,855.35	30,299.35				
From general Treasury.....			18,647.34	15,000.00		100,000.00
Total.....	19,059,686.12	159,061.18		17,876.66	14,054.08	174,447.46
Expenditures:						
Repayment bond loan.....	1,000,000.00					
Disbursements.....	10,171,718.85			8,337.29	688.36	74,192.25
Total.....	11,171,718.85			8,337.29	688.36	74,192.25
Balance on hand, June 30, 1929.....	7,887,967.27	159,061.18		9,539.37	13,365.72	100,255.21

¹ Contra.

RECLAMATION TABLE 3.—*Accretions to reclamation fund, by States*

States	Sale of public lands		Proceeds from oil-leasing act		Potassium royalties and rentals ¹	Total to June 30, 1929
	Fiscal year 1929	To June 30, 1929	Fiscal year 1929	To June 30, 1929		
Alabama			\$4,409.00	\$52,656.93		\$52,656.93
Arizona	\$65,188.10	\$2,392,620.60				2,392,620.60
California	85,208.27	7,825,216.32	321,448.97	7,049,173.75	\$52,684.69	14,927,074.76
Colorado	58,627.54	10,030,642.24	50,951.66	272,258.41		10,302,900.65
Idaho	24,279.01	6,859,974.51	1,497.85	4,546.37		6,864,520.88
Kansas		1,032,764.48				1,032,764.48
Louisiana			6,059.26	18,167.66		18,167.66
Montana	64,936.32	15,041,338.77	56,593.98	855,134.95		15,896,473.72
Nebraska	2,515.69	2,092,488.16				2,092,488.16
Nevada	13,271.16	979,755.25	365.00	3,053.10		982,808.35
New Mexico	90,440.33	6,142,930.36	22,636.61	59,278.49		6,202,268.85
North Dakota	942.12	12,207,497.76	15,205.64	54,460.37		12,261,898.13
Oklahoma	² 1,297.41	5,924,052.79				5,924,052.79
Oregon	40,466.25	11,846,011.59				11,846,011.59
South Dakota	4,336.88	7,712,489.41	20.00	335.48		7,712,824.89
Utah	83,782.29	4,070,474.11	44,343.30	179,789.56		4,250,263.67
Washington	9,422.78	7,354,369.10	225.78	13,741.97		7,368,111.07
Wyoming	105,117.62	8,119,348.95	1,329,027.98	27,407,900.57		35,527,249.52
Total	647,236.95	109,631,974.40	1,852,785.03	35,970,437.61	52,684.69	145,655,096.70
Proceeds, Federal water-power licenses						³ 59,209.22
Grand total						145,714,305.92

¹ Proceeds for fiscal year, \$12,517.57.² Contra.³ Proceeds for fiscal year, \$17,201.18.

NOTE.—Sales of reclamation town lots are no longer considered as accretions to the reclamation fund for the reason that Subsec. 1 of section 4 of the act of Dec. 5, 1924 (43 Stat. 701), provides for the crediting of profits from this source to the construction charge of the various projects.

RECLAMATION TABLE 4.—Consolidated statement, by projects, of construction cost of irrigation works, other cost reimbursable with construction, and amounts to be repaid by water users

State and project	Construction cost		Operation and maintenance before public notice (net)		Operation and maintenance deficits and penalties		Construction revenues (contra)		Abandoned works, non-reimbursable cost and authorized charge-offs ¹	Total to be repaid by water users	
	Fiscal year 1929	To June 30, 1929	Fiscal year 1929	To June 30, 1929	Fiscal year 1929	To June 30, 1929	Fiscal year 1929	To June 30, 1929		Fiscal year 1929	To June 30, 1929
Arizona: Salt River.....		\$12,744,222.59		\$115,993.50		\$2,921.96		\$2,312,096.81		\$882,097.31	\$10,166,021.97
Arizona-California: Yuma.....	\$58,222.39	9,350,931.53		374,302.27			\$22,927.76	213,830.22		\$33,033.63	9,514,325.34
California: Orland.....	147,654.30	2,393,130.94		\$12,823.99			3,773.05	25,536.16		143,881.25	2,356,280.79
Colorado:											
Grand Valley.....	9,964.08	4,768,242.03		138,621.28				54,718.89		9,964.08	4,039,769.78
Uncompahgre.....		6,438,176.91		299,309.47		\$8,173.50		24,223.72		1,253,322.88	5,463,113.28
Idaho:											
American Falls.....		7,635,054.96		9,000.00				19,020.30			7,625,034.66
Boise.....	\$3,213.81	14,580,884.94		422,283.48		2,245.78		69,974.74		82,393.84	15,726,539.07
King Hill.....		1,905,318.80						28,187.27		497,285.10	1,489,968.94
Minidoka.....	69,495.52	6,919,552.49		313,431.13				1,805,473.64		56,254.85	5,784,834.73
Minidoka gravity extension.....						\$331.46		140,002.30		2,288.15	
Kansas: Garden City.....	321,618.25	374,541.92		52,868.10				1,000.00		321,618.25	373,541.92
Montana:											
Huntley.....		1,562,302.99		164.63				18,356.91		62,049.83	1,859,757.99
Milk River.....	10,371.87	6,768,679.88		439,118.38		20,365.07		83,698.85		1,911,189.00	5,301,003.30
San River.....	1,204,699.87	6,730,296.88		1,342.30		10,758.38		44,429.90		89,319.70	6,811,857.34
Montana-North Dakota:											
Lower Yellowstone.....	178,825.44	3,437,695.45		\$279.72		\$989.02		49,353.23		382,254.00	3,904,997.37
Nebraska-Wyoming: North Platte.....	29,966.36	19,163,144.88		703,116.34		2,951.62		256,600.01		30,322.30	21,085,683.45
Nevada: Newlands.....	108,876.77	7,956,026.60		503.28		20,405.33		52,346.95		4,437,820.00	3,484,709.54
New Mexico:											
Carlsbad.....		1,464,522.57		\$17,603.27				26,011.99		\$2,065.18	1,422,841.31
Hondo.....		339,491.08		32,952.61				656.63		371,787.66	
New Mexico-Texas: Rio Grande.....	81,834.77	14,817,009.01		18,875.50				287,051.97		1,260,675.97	12,971,423.26
North Dakota:											
Buford-Trenton.....		223,423.06		\$31.75				1,907.62		221,423.09	
Williston.....		517,630.09		\$165.00				86,970.36		430,494.73	
Oregon:											
Baker.....	2,017.13	68,334.33						5,000.00			63,334.33
Umatilla.....	11,131.33	5,176,914.35						30,290.55		888,340.82	4,452,425.41
Vale.....	773,067.50	1,305,251.04						5,000.00		773,067.50	1,300,251.04
Oregon-California: Klamath.....	121,447.00	5,497,864.93		1,800.73				320,494.46		7,499.72	5,249,864.86
Oregon-Idaho: Owyhee.....	695,274.53	1,609,109.74		72,943.08		3,712.03		19,666.23		695,274.53	1,604,755.13

South Dakota: Belle Fourche.....	231,137.46	3,855,320.21	-----	\$ 1,980.03	163,506.44	669,943.43	505.67	17,071.02	379,031.58	15,106.65	4,127,172.01
Utah:											
Salt Lake Basin.....	724,565.04	1,399,025.95	-----	-----	-----	-----	15,757.93	34,327.73	-----	708,807.11	1,364,701.22
Strawberry Valley.....	-----	3,507,423.49	-----	10,744.06	-----	71,454.61	21,870.56	258,373.12	-----	* 21,870.56	3,351,243.04
Washington:											
Okanogan.....	4,159.40	1,451,720.31	-----	247,766.87	-----	25,194.37	-----	6,630.78	998,318.06	* 994,158.66	424,198.97
Yakima.....	35,133.98	14,441,902.32	-----	* 63,957.96	-----	83,326.81	8,333.96	335,561.04	4,214.60	26,735.02	14,698,495.53
Yakima-Kittitas.....	2,541,379.65	4,907,003.47	-----	-----	-----	-----	30.00	1,100.76	-----	2,541,349.65	4,905,902.71
Wyoming:											
Riverton.....	386,924.13	3,354,931.05	-----	13,478.33	-----	-----	19,097.68	13,535.56	-----	373,751.30	3,354,923.82
Shoshone.....	88,289.83	9,577,644.36	-----	25,061.37	3,485.07	308,913.59	* 81,445.72	76,852.07	1,702,298.84	177,307.82	8,135,408.41
Total.....	7,898,304.69	186,586,342.23	153,782.21	2,677,169.30	625,210.28	5,728,016.06	* 317,567.42	6,654,549.09	16,546,277.38	5,683,982.31	171,790,701.77

Abandoned works: 1	
Garden City.....	\$334,474.96
Hondo.....	371,787.66
Buford-Trenton.....	221,423.69
Williston.....	430,494.73
<hr/> 1,358,181.04 <hr/>	

Nonreimbursable cost:	
Salt River.....	382,097.31
Rio Grande Dam.....	1,000,000.00
<hr/> 1,382,097.31 <hr/>	

Authorized charge-offs, act of May 25, 1926:	
Grand Valley.....	812,374.64
Uncompahgre.....	1,285,822.88
Boise.....	82,393.84
King Hill.....	497,285.40
Mindoka.....	2,288.15
Huntley.....	62,049.83
Milk River.....	1,911,189.00
Sun River.....	89,319.70
Lower Yellowstone.....	382,254.00
North Platte.....	30,322.30
Newlands.....	4,437,520.00
Rio Grande.....	260,675.97
Umatilla.....	888,340.52
Klamath.....	7,499.72
Belle Fourche.....	379,031.58
Okanogan.....	998,318.06
Yakima.....	4,214.60
Shoshone.....	1,702,298.84
<hr/> 13,805,999.03 <hr/>	

Contra,

RECLAMATION TABLE 5.—Consolidated statement, by projects, of operation and maintenance cost, operation and maintenance returns and other credits, and results, calendar year 1928

State and project	Cost	Operation and maintenance returns				Other credits ¹	Results, excess (+) or deficit (—)
		Charges con- tracted	Penalties	Discounts (contra)	Miscella- neous rev- enues		
Arizona: Yuma auxiliary.....	\$21,931.73	\$38,564.86			\$1,368.55		+\$7,981.68
Arizona-California: Yuma.....	312,689.81	446,197.27	\$7,002.34	\$6,207.12	12,362.09		+147,264.77
California: Orland.....	32,862.27	32,226.02	432.39	2,489.40	285.02		-2,408.24
Colorado:							
Grand Valley.....	48,803.00	48,000.00			803.00		
Uncompahgre.....	121,026.31	243,367.61	106.35	\$ 2.94	3,007.55		+125,458.14
Idaho:							
Boise.....	29,413.22	25,076.07				\$95.25	-4,241.90
Boise (drainage).....		\$ 30.46					-30.46
Minidoka.....	92,306.28	94,575.17			\$ 496.42		+1,772.47
Montana:							
Huntley.....	216.00	\$ 5,758.74	2.38			396,023.66	+330,051.30
Milk River.....	49,459.97	28,881.20		472.50	1,774.51	23,768.87	+4,382.11
Sun River.....	18,039.64	725.71	5.31		6,714.33	11,070.98	+476.79
Montana-North Dakota: Lower Yellowstone.....	41,796.98	39,600.96			806.04		-1,089.98
Nelaska-Wyoming: North Platte.....	24,363.78	\$ 3,333.06	\$ 3,781.12		1,142.00	400.31	-29,875.65
Nevada: Newlands.....	58,056.22	\$ 1,589.78	75.20		2,152.00		-1,514.58
New Mexico: Carlisle.....	39,213.47	750.98		1,038.46			-16,918.23
New Mexico-Texas: Rio Grande.....	412,351.50	420,552.05	2,526.59		\$ 35,487.00		-24,759.86
North Dakota: Williston.....		34,802.50	\$ 77.72		18.00		+102,617.83
Oregon: Umatilla.....	3,647.71	85,899.00	118.09		196.50	71,344.26	+986.29
Oregon-California: Klamath.....	91,881.88	\$ 111,413.71	\$ 2,758.97	\$.83	6,850.48	183,363.91	+4,466.45
South Dakota: Belle Fourche.....	67,030.26	\$ 137.99	728.49	\$.12	2,304.65		+580.62
Utah: Strawberry Valley.....							
Washington:							
Okanogan.....	26,000.17	36,818.77		12.87	344.50		+11,150.23
Yakima.....	208,046.51	248,400.37	7,350.83	3,446.59	\$ 1,556.01		-12,316.09
Wyoming: Shoshone.....	31,743.38	8,420.42	\$ 57.38		2,291.99	18,742.23	-2,348.12
Total.....	1,752,258.62	1,749,388.31	13,028.76	13 633.05	12,050.31	703,174.86	+711,695.57

¹ Contra.¹ Amounts to be repaid with construction and charge-offs under act of May 25, 1926 (44 Stat. 636).

RECLAMATION TABLE 6.—Consolidated statement, by projects, of operation and maintenance cost, operation and maintenance returns and other credits, and results to December 31, 1928

State and project	Cost	Operation and maintenance returns				Other credits		Results, excess (+) or deficit (—)
		Charges contracted	Penalties	Discounts (contra)	Miscellaneous revenues	Deficits uncollectible	Amounts to be repaid with construction	
Arizona: Yuma auxiliary	\$252,676.14	\$299,017.98	\$537.74	\$1,106.79	\$4,305.05			+\$50,077.84
Arizona-California: Yuma	3,746,167.38	3,843,337.96	89,650.98	46,461.52	158,970.59		\$2,921.96	+327,202.59
California: Orland	384,498.95	1,246.30	1,246.30	18,214.95	2,686.19			+14,790.51
Colorado:								
Grand Valley	48,803.00	48,000.00			803.00			
Uncompahgre	810,151.77	809,863.56	14,129.34	11,602.77	16,246.27			
Idaho:								
Boise	2,229,071.99	1,567,533.10	31,157.58	46,526.29	111,044.96			
Boise (drainage)	506,005.16	473,656.38	38,611.62	6,123.43				
King Hill	156,734.25	60,711.27	1,519.05	1,519.05	342.89		601,024.95	+35,162.31
Minidoka	2,008,281.45	1,638,649.18	29,463.35	22,341.74	99,248.36		97,199.14	+139.41
Montana:								
Hurley	1,014,943.79	557,745.45	15,712.18	10,449.84	11,596.61	1 \$81,354.00	358,985.39	+18,484.63
Milk River	150,503.21	77,503.51		1,060.00	3,553.09			
Sun River	279,341.33	157,623.40	6,360.24	3,468.33	16,022.23	1 34,148.00		+35,162.31
Montana-North Dakota: Lower Yellowstone	1,176,568.43	214,078.55	2,59	4,463	129,831.19			+139.41
Nebraska-Wyoming: North Platte	2,700,926.64	1,772,179.23	27,304.03	35,811.80	29,376.14			
Nevada: Newlands	1,453,150.54	1,188,785.73	28,660.62	24,970.08	26,012.61	1 211,292.00		+28,703.49
New Mexico: Carlisbad	749,110.33	713,523.15	27,364.31	14,016.86	23,235.60			+135,853.63
New Mexico-Texas: Rio Grande	2,322,567.39	2,245,246.57	7,989.28	4,486.44	49,053.12		1,934.00	+7,223.21
North Dakota:								
Bufford-Trenton	74,781.07	2,317.41			10.00	2 72,473.66		-24,759.86
Williston	904,662.04	34,042.75	45.81		489,754.75			
Oregon: Umatilla	683,995.37	379,168.49	7,697.84	3,314.38	40,006.32			
Oregon-California: Klamath	1,023,615.52	987,682.80	3,544.92	4,942.27	58,767.22	1 91,083.35		+12,173.13
South Dakota: Belle Fourche	1,378,677.13	722,308.18	29,196.35	9,240.72	21,492.75	1 119,606.00		+25,148.78
Utah: Strawberry Valley	487,856.39	376,880.88	10,196.17	11,858.67	20,400.50			+104,610.33
Washington:								
Okanogan	649,410.01	559,371.28	1,451.15	307.47	70,485.39			-10,750.46
Yakima	3,821,315.85	3,678,368.17	73,029.72	47,492.96	116,063.21			+6,084.71
Wyoming: Shoshone	898,724.67	563,258.71	13,632.88	11,052.56	45,335.17	1 38,036.00		+6,289.77
Total	29,862,579.80	23,409,422.61	458,974.60	336,453.85	1,545,307.01	1,028,791.74	4,520,600.02	+764,027.33

1 Charge offs under act of May 25, 1926 (44 Stat. 636).

2 Projects abandoned.

RECLAMATION TABLE 7.—*Accounts receivable, construction water-right charges (including contributed funds)*

State and project	Due		Collected			Uncollected June 30, 1929
	Fiscal year 1929	To June 30, 1929	Cash		Other credits to June 30, 1929	
			Fiscal year 1929	To June 30, 1929		
Arizona:						
Salt River.....	\$1,042,691.48	\$5,286,331.45	\$1,688,762.16	\$5,286,331.45		
Yuma auxiliary.....	¹ 65,077.29	635,167.19	¹ 46,965.07	585,516.31	\$3,148.10	\$46,502.78
Arizona-California: Yuma.....	323,811.91	3,257,480.07	300,347.31	2,890,216.34	278,729.18	88,534.55
California: Orland.....	67,023.97	636,714.74	65,380.08	620,740.94		15,973.80
Colorado:						
Grand Valley.....	19,995.36	39,990.72	11,677.71	28,901.72		11,089.00
Uncompahgre.....	¹ 94,818.56	585,864.77	43,657.31	380,597.08	60,096.64	145,171.05
Idaho:						
American Falls.....	33,420.39	3,379,061.73	118,714.16	3,379,061.73		
Boise.....	412,514.34	3,008,279.20	413,442.74	2,967,762.43	25,312.35	15,204.42
King Hill.....	8,650.00	16,675.66		8,025.66		8,650.00
Minidoka.....	203,767.60	4,187,121.64	195,882.77	3,749,215.31	328,108.22	109,798.11
Minidoka gravity extension.....	140,000.00	141,000.00	100,000.00	101,000.00		40,000.00
Montana:						
Huntley.....	87,108.62	527,172.34	5,711.90	445,273.41	81,898.93	
Milk River.....	3,002.76	3,002.76	3,002.76	3,002.76		
Sun River.....	7,262.99	185,527.72	7,163.01	184,379.93	595.30	552.49
Montana-North Dakota:						
Lower Yellowstone.....	44,538.76	152,483.53	44,232.95	152,177.72		305.81
Nebraska-Wyoming:						
North Platte.....	108,780.76	2,735,492.00	150,319.13	2,344,072.63	214,722.36	176,697.01
Nevada: Newlands.....	82,619.73	886,227.93	76,616.70	865,728.43	18,380.66	1,118.84
New Mexico: Carlsbad.....	65,194.76	793,714.62	61,804.77	759,350.06	81.25	34,283.31
New Mexico-Texas: Rio Grande.....	517,168.36	2,200,769.36	449,834.56	1,787,569.36	244,700.00	168,500.00
Oregon:						
Baker.....		5,000.00		,000.00		
Umatilla.....	¹ 27,312.21	420,303.81	¹ 44,612.42	274,824.25	1,087.72	44,391.84
Vale.....		5,000.00		5,000.00		
Oregon-California: Klamath.....	84,642.14	967,548.88	44,871.01	961,447.99		66,100.89
Oregon-Idaho: Owyhee.....		4,354.61		4,354.61		
South Dakota: Belle Fourche.....	¹ 249,336.20	552,811.91	¹ 1,846.18	482,933.60	69,878.31	
Utah:						
Salt Lake Basin.....	15,494.43	34,064.23	17,979.08	34,064.23		
Strawberry Valley.....	112,426.56	992,603.94	114,531.28	988,496.94	4,107.00	
Washington:						
Okanogan.....	¹ 49,707.61	120,365.51	12,866.60	120,365.51		
Yakima.....	428,450.14	5,714,477.11	378,349.48	5,440,856.17	36,047.07	237,573.87
Yakima-Kittitas.....		1,000.00		1,000.00		
Wyoming: Shoshone.....	33,904.89	781,300.65	49,290.67	730,621.56	2,836.31	47,842.78
Total.....	3,356,218.08	38,256,908.08	4,261,014.47	35,628,888.13	² 1,369,729.40	1,258,290.55
Paid in advance of due dates.....			¹ 46,337.45	120,012.78	³ 43,146.99	
Refunds.....			36,549.31	84,980.73		
Total collections.....			4,251,226.33	35,833,881.64		

¹ Contra.² Other credits for fiscal year \$240,028.05.³ Decrease for fiscal year \$66,891.27.

RECLAMATION TABLE 8.—*Accounts receivable, operation and maintenance charges (after public notice)*

State and period	Due		Collected			Uncollected June 30, 1929
	Fiscal year, 1929	To June 30, 1929	Cash		Other credits to June 20, 1929	
			Fiscal year, 1929	To June 30, 1929		
Arizona: Yuma auxiliary	\$28,652.84	\$327,089.13	\$65,752.90	\$303,935.24	\$7,862.04	\$15,291.85
Arizona-California: Yuma	236,442.64	2,957,647.19	320,113.89	2,805,291.67	62,151.54	90,203.98
California: Orland	32,448.62	413,562.92	30,850.17	388,139.90	18,214.95	7,208.07
Colorado:						
Grand Valley	50,000.00	98,000.00	42,593.16	88,000.00		10,000.00
Uncompahgre	4,790.27	753,272.97	219,720.65	686,360.35	30,873.90	36,038.72
Idaho:						
Boise	40,015.92	1,602,641.93	40,222.75	1,555,955.08	46,526.29	160.56
Boise (drainage)	¹ 69.31	473,617.53		467,411.70	6,123.43	82.40
King Hill		60,711.27		59,192.22	1,519.05	
Minidoka	93,054.12	1,731,392.08	90,515.14	1,640,953.44	83,849.62	6,589.02
Montana:						
Huntley	18,408.89	519,006.02	22,307.76	505,950.83	11,193.03	1,862.16
Milk River	34,400.00	91,409.51	31,454.65	85,497.65	1,211.25	4,700.61
Sun River	830.86	158,154.26	905.84	154,231.64	3,922.62	
Montana-North Dakota:						
Lower Yellowstone	46,208.18	241,893.73	52,104.13	238,969.99	4.63	2,919.11
Nebraska-Wyoming: North Platte	¹ 14,992.17	1,798,356.27	32,077.66	1,727,411.70	58,581.22	12,363.35
Nevada: Newlands	15,919.25	1,136,951.67	20,421.77	1,098,271.65	38,680.02	
New Mexico: Carlsbad	39,233.37	713,523.15	36,765.04	682,313.47	14,259.33	16,950.35
New Mexico-Texas: Rio Grande	385,156.30	2,139,287.76	359,217.36	2,074,862.38	41,507.44	22,917.94
North Dakota:						
Buford-Trenton		2,317.41		2,317.41		
Williston		34,042.75		34,042.75		
Oregon: Umatilla	24,953.79	365,391.26	31,061.91	363,635.22	4,756.04	
Oregon-California: Klamath	130,300.89	908,519.38	128,794.16	835,565.93	30,536.22	42,417.23
South Dakota: Belle Fourche	¹ 137,619.09	752,308.18	75,405.45	742,932.19	9,375.99	
Utah: Strawberry Valley	54.44	376,727.09	106.42	364,868.42	11,858.67	
Washington:						
Okanogan	¹ 171,648.93	371,441.72	5,650.00	368,788.67	2,653.05	
Yakima	259,559.23	3,736,070.84	208,699.48	3,521,007.46	50,558.96	164,504.42
Wyoming: Shoshone	12,200.92	577,660.79	17,240.62	514,994.46	23,321.48	39,344.85
Total	1,128,292.03	22,340,996.81	1,831,920.91	21,307,901.42	² 559,540.77	473,554.62
Paid in advance of due dates			¹ 38,642.49	53,366.04	³ 35,132.79	
Penalties and interest	16,341.69	467,743.06	11,311.03	448,564.49	⁴ 18,832.01	346.56
Refunds			154.75	22,181.43	156.69	
Total collections			1,804,744.20	21,832,013.38		

¹ Contra.² Other credits for fiscal year \$69,557.09.³ Increase for fiscal year \$34,248.09.⁴ Increase for fiscal year \$12,105.94.

RECLAMATION TABLE 9.—*Accounts receivable, rentals of irrigation water*

State and project	Due		Collected			Uncollected June 30, 1929
	Fiscal year 1929	To June 30, 1929	Cash		Other credits to June 30, 1929	
			Fiscal year 1929	To June 30, 1929		
Arizona:						
Salt River.....		\$2, 246, 726. 01		\$2, 246, 726. 01		
Yuma auxiliary.....	\$1, 428. 55	5, 690. 05	\$1, 626. 25	5, 690. 05		
Arizona-California: Yuma	8, 414. 43	487, 979. 55	7, 177. 38	474, 331. 94	\$12, 654. 19	\$993. 42
California: Orland.....		121, 266. 00		121, 266. 00		
Colorado:						
Grand Valley.....		419, 306. 66		406, 419. 39	6, 500. 67	6, 386. 00
Uncompahgre.....	¹ 2, 586. 67	1, 204, 345. 78	5, 379. 93	1, 188, 053. 85	13, 217. 03	3, 074. 90
Idaho:						
American Falls Reservoir.....	17, 480. 22	26, 984. 22	17, 480. 22	26, 984. 22		
Boise.....		749, 688. 57		744, 968. 07	4, 720. 50	
Minidoka.....	30, 715. 63	305, 982. 72	30, 842. 18	302, 743. 49	3, 234. 23	5. 00
Montana:						
Huntley.....	54. 18	9, 521. 84	54. 18	9, 486. 18		35. 66
Milk River.....	39. 93	225, 997. 53	653. 74	221, 702. 41	1, 208. 14	3, 086. 98
Sun River.....	5, 048. 66	121, 301. 13	16, 746. 16	113, 010. 11	1, 287. 74	7, 003. 28
Montana-North Dakota:						
Lower Yellowstone.....	709. 79	127, 779. 40	956. 76	127, 779. 40		
Nebraska-Wyoming: North						
Platte.....	1, 638. 00	326, 926. 04	1, 935. 00	326, 916. 04	10. 00	
Nevada: Newlands.....	592. 59	28, 144. 71	592. 59	21, 967. 86	6, 176. 85	
New Mexico:						
Carlsbad.....	2, 752. 75	37, 715. 33	2, 750. 05	37, 712. 63		2. 70
Hondo.....		9, 129. 70		9, 129. 70		
New Mexico-Texas: Rio						
Grande.....	30, 306. 61	1, 293, 724. 30	83, 939. 11	1, 293, 063. 30		661. 00
North Dakota:						
Buford-Trenton.....		31. 75		31. 75		
Williston.....		2, 117. 28		2, 117. 28		
Oregon: Umatilla.....	24, 442. 11	71, 204. 73	5, 087. 66	43, 584. 68		27, 620. 05
Oregon-California: Klamath.....	25, 203. 89	126, 877. 10	24, 337. 44	125, 014. 57		1, 862. 53
South Dakota: Belle Fourche.....	432. 24	7, 514. 98	432. 24	7, 497. 18	17. 80	
Utah: Strawberry Valley.....		17, 596. 13		17, 596. 13		
Washington:						
Okanogan.....		110, 645. 28		108, 061. 09	2, 584. 19	
Yakima.....	2, 718. 66	159, 429. 17	3, 057. 34	158, 824. 60		604. 57
Wyoming:						
Riverton.....	1, 690. 10	4, 145. 70	1, 532. 12	3, 924. 58	221. 12	
Shoshone.....	4, 674. 10	44, 786. 01	4, 686. 22	44, 503. 51	55. 92	226. 58
Total.....	155, 755. 77	8, 292, 557. 07	209, 266. 57	8, 189, 106. 02	² 51, 888. 38	51, 562. 67

¹ Contra.² Other credits for fiscal year, \$2,005.86.

RECLAMATION TABLE 10.—*Voucher transactions, all funds, and net investment as of June 30, 1929*

Fund	Expenditures		Collections		Net investment	
	Fiscal year 1929	To June 30, 1929	Fiscal year 1929	To June 30, 1929	Fiscal year 1929	To June 30, 1929
Reclamation fund..	\$10,171,718.85	\$234,409,662.40	\$7,878,726.41	\$85,583,323.75	\$2,292,992.44	\$148,826,338.65
Increase of compensation (net).....		2,797,960.33				2,797,960.33
Judgments, Court of Claims.....	357.00	600,008.24			357.00	600,008.24
Rio Grande Dam appropriation (net).....		1,000,000.00				1,000,000.00
Wind River Indian Riverton (net).....		359,176.04				359,176.04
General investigations, Reclamation Service, 1923-24 (net).....		266,352.66				266,352.66
Yuma auxiliary project fund.....		788,561.27	30,299.35	947,622.45	30,299.35	159,061.18
Drainage and cut-over fund (net).....		99,815.08				99,815.08
Arid, semiarid, swamp, and cut-over timberlands (net).....	8,337.29	35,460.63			8,337.29	35,460.63
Columbia Basin irrigation project (net).....	688.36	11,634.28			688.36	11,634.28
Colorado River levee system (net).....	74,192.25	99,744.79			74,192.25	99,744.79
Total.....	10,255,293.75	240,468,375.72	7,909,025.76	86,530,946.20	2,346,267.99	153,937,429.52

¹ Includes \$557,028.52 covering sales of reclamation town sites to June 30, 1928. Subsection I of sec. 4, of the act of Dec. 5, 1924 (43 Stat. 701), provides for the crediting of profits from this source to the construction charge of the various projects. For this reason receipts from these sales are no longer considered as accretions to the reclamation fund, but rather as reductions of the net investment.

² Contra.

RECLAMATION TABLES 11-14.—*Engineering data for projects on completion*

[The following tables of data for projects on completion, covering reservoirs, storage dams, diversion dams and irrigable area, are necessarily subject to some revision as the projects develop and more detailed plans are prepared. In so far as they refer to works yet to be built or areas not yet covered by canals they are not to be taken as guaranteeing that such work will ever be done. All future work depends on appropriations therefor by Congress.]

No. 11. RESERVOIRS

Projects	Name	Area	Capacity	Spillway			
				Length	Elevation above stream bed	Capacity	
						Normal	Maximum
Arizona:		<i>Acres</i>	<i>Acre-feet</i>	<i>Feet</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Sec.-ft.</i>
Salt River.....	Roosevelt.....	18,300	1,637,300	378	224	113,000	150,000
Do.....	Mormon Flat.....	1,000	63,200	213	131		150,000
Do.....	Horse Mesa.....	2,600	215,000	213	213		150,000
Do.....	Stewart Mountain.....	1,300	70,000	400			150,000
Do.....	Cave Creek flood control.....	760	14,000	1,732	59	20,000	60,000
California:							
Orland.....	East Park.....	1,850	51,000	415	88	8,000	12,000
Do.....	Stony Gorge.....	1,280	50,200	90	96	30,000	50,000
Colorado: Uncompahgre.	Taylor Park.....	2,260	106,000	(1)	(1)	(1)	(1)
Idaho:							
Boise.....	Deer Flat.....	9,835	177,000	None.			
Do.....	Arrowrock.....	2,800	280,000	402	247	15,000	40,000
Do.....	Deadwood.....	3,000	160,000				
Minidoka.....	Lake Walcott.....	11,850	2 150,000	2,385	42	40,000	60,000
Do.....	Jackson Lake.....	25,540	847,000	160	41	7,500	13,000
Do.....	American Falls.....	56,055	1,700,000	540	60	60,000	115,000

¹ Undetermined.

² 95,180 acre-feet only available; above fixed crest of spillway.

RECLAMATION TABLES 11-14.—Engineering data for projects on completion—Con.

No. 11. RESERVOIRS—Continue 1

Projects	Name	Area	Capacity	Spillway			
				Length	Elevation above stream bed	Capacity	
						Normal	Maximum
Montana:		<i>Acres</i>	<i>Acre-feet</i>	<i>Feet</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Sec.-ft.</i>
Milk River.....	Sherburne Lakes.....	2,000	78,000	160	68	³ 200	8,000
Do.....	St. Mary Lakes.....	6,910	124,000	500		20,500	20,000
Do.....	Nelson Reservoir.....	4,560	68,500	(⁴)	⁴ 23		
Do.....	Point of Rocks.....	180	830	740	8	³ 0	700
Do.....	Chain Lakes.....	9,400	244,000	⁵ 300	58	³ 300	10,000
Sun River.....	Willow Creek.....	1,050	16,700	50	62.5		2,000
Do.....	Gibson.....	1,360	105,000	314	170		50,000
Do.....	Pishkun.....	415	3,520	Under	control.		
Do.....	Muddy Creek.....	1,830	33,000		80	28 ¹ / ₂	(¹)
Nebraska-Wyoming:							
North Platte.....	Pathfinder.....	22,700	1,070,000	605	184	40,000	
Do.....	Lake Alice.....	900	11,400	100	18	2,500	
Do.....	Lake Minatare.....	2,240	60,760	100	55	2,000	
Do.....	Winters Creek Lake.....	300	3,000	None.			
Do.....	Guernsey.....	2,340	72,700	⁶ 50 ⁷ 128	45 95		50,000 30,000
Nevada:							
Newlands.....	Lake Tahoe.....	124,000	120,000	85	6	2,500	
Do.....	Lahontan.....	10,000	⁸ 273,600	500	112	18,800	30,000
New Mexico:							
Carlsbad.....	Avalon.....	970	7,000	1,026	21	86,000	120,000
Do.....	McMillan.....	6,600	45,000	1,750	26.1-24.9	34,500	60,000
New Mexico-Texas:							
Rio Grande.....	Elephant Butte.....	40,080	2,638,000	275	193	8,000	16,000
Oregon:							
Umatilla.....	Cold Springs.....	1,500	50,000	330	90	6,000	6,000
Do.....	McKay.....	1,600	75,000	120	140	10,000	10,000
Oregon-California:							
Klamath.....	Upper Klamath Lake.....	60,000	400,000	None.			
Do.....	Clear Lake.....	25,000	462,000	357	24	10,000	30,000
Do.....	Gerber.....	3,800	94,000	150	63		10,000
Oregon-Idaho:							
Owyhee.....	Owyhee.....	12,600	715,000	188.5	312	30,000	40,000
South Dakota:							
Belle Fourche.....	Belle Fourche.....	8,010	203,000	314	100	2,000	2,000
Utah:							
Strawberry Valley.....	Strawberry Valley.....	8,370	255,000	58	61	500	2,000
Salt Lake Basin.....	Echo.....	1,470	74,000	72	98		15,000
Washington:							
Okanogan.....	Salmon Lake.....	240	10,500	Siphon.	48		400
Do.....	Conconnully.....	460	14,400	180	58	4,500	16,000
Yakima.....	Bumping Lake.....	1,300	34,000	235	36		6,000
Do.....	Lake Cle Elum.....	4,680	501,000	420	112		18,000
Do.....	Lake Kachess.....	4,540	210,000	250	53		7,200
Do.....	Tieton.....	2,500	202,500	390	206		50,000
Do.....	Lake Keechelus.....	2,550	152,000	300	60		10,000
Do.....	Clear Lake.....	270	5,830	261	58		
Wyoming:							
Riverton.....	Pilot Butte.....	880	30,000	100			500
Do.....	Bull Lake.....	3,100	145,000	170	67	4,000	8,000
Shoshone.....	Shoshone.....	6,600	456,000	300	233	11,000	30,000
Do.....	Ralston.....	200	2,100				
Do.....	Deaver.....	80	680	None.			
Total.....		526,135	14,618,320				

¹ Undetermined.² Average flow of stream on which reservoir is located.³ No spillway; drainage limited; elevation is that of water surface.⁴ Consists of 8 siphons each 5 feet high and 10 feet wide at throat.⁵ One 50 by 50 Stoney gate; gate sill 45 feet above river bed.⁶ Two 64 by 14½-foot drum gates; top elevation 95 feet above river bed.⁷ At spillway level; proposed to increase to 290,000 by adding 2 feet by movable crest.

RECLAMATION TABLES 11-14.—*Engineering data for projects on completion—Con.*

No. 12. STORAGE DAMS

Projects	Name	Type	Maximum height	Crest length	Volume
Arizona:			<i>Feet</i>	<i>Feet</i>	<i>Cubic yards</i>
Salt River.....	Roosevelt ¹⁰	Rubble masonry arch, gravity.	280	1,080	342,970
Do.....	Mormon Flat ¹⁰	Concrete, variable radius arch.	229	623	42,980
Do.....	Horse Mesa ¹⁰	do.....	305	784	147,360
Do.....	Stewart Mountain	Variable radius arch.....	180	1,200	80,000
Do.....	Cave Creek flood control. ¹⁰	Reinforced concrete multiple arch.	109	1,680	18,770
California:					
Orland.....	East Park ¹⁰	Concrete arch, gravity.....	139	250	12,200
Do.....	Stony Gorge ¹⁰	Ambursen, reinforced concrete.	142.5	868	43,140
Colorado: Uncompahgre	Taylor Park.....	Undetermined.....	(11)	(11)	(11)
Idaho:					
Boise.....	Upper Deer Flat ¹⁰	Earth fill.....	70	4,000	1,190,280
Do.....	Lower Deer Flat ¹⁰	do.....	40	7,200	1,207,610
Do.....	Deer Flat Forest ¹⁰	do.....	16	950	22,500
Do.....	Arrowrock ¹⁰	Rubble concrete arch, gravity.	349	1,100	585,130
Do.....	Deadwood.....	Concrete arch.....	160	700	50,000
Minidoka.....	Minidoka ¹⁰	Rock fill, concrete core.....	86	937	242,500
Do.....	Jackson Lake ¹⁰	Massive concrete gate section and earth fill.	67	4,450	345,400
Do.....	American Falls ¹⁰	{ Concrete gravity and earth embankment. }	87	{ 3,096 2,162 }	{ 170,000 150,000 }
Montana:					
Milk River.....	Sherburne Lakes ¹²	Earth fill.....	83	1,133	201,500
Do.....	St. Mary Lakes.....	do.....	30	2,000	135,000
Do.....	Nelson ¹⁰	do.....	28	9,900	175,000
Do.....	Point of Rocks ¹⁰	do.....	12.5	2,680	31,000
Do.....	Connolly.....	do.....	68	3,125	2,019,000
Sun River.....	Willow Creek.....	do.....	72.5	525	196,400
Do.....	Gibson ¹⁰	Concrete arch.....	205	882	160,000
Do.....	Pishkun.....	Earth fill.....	19	2,270	28,470
Do.....	Muddy Creek.....	do.....	90	800	440,000
Nebraska-Wyoming:					
North Platte.....	Pathfinder ¹⁰	Broken range masonry arch	218	432	60,210
Do.....	Pathfinder Dike ¹⁰	Earth fill.....	38	1,650	152,250
Do.....	Upper Lake Alice ¹⁰	do.....	30	3,100	240,000
Do.....	Lower Lake Alice ¹⁰	do.....	23	2,550	119,000
Do.....	Minature ¹⁰	do.....	65	3,700	570,000
Do.....	Guernsey ¹⁰	Sand, gravel, and rock fill.	105	560	561,260
Nevada:					
Newlands.....	Lake Tahoe ¹⁰	Concrete sluiceway regulator.	14	109	430
Do.....	Lahontan ¹⁰	Earth and gravel fill with concrete spillways.	124	1,400	770,000
New Mexico:					
Carlsbad.....	Avalon ¹⁰	Earth and rock fill, concrete core.	50	1,380	168,770
Do.....	McMillan ¹⁰	Earth and rock fill.....	55	2,070	150,740
New Mexico-Texas:					
Rio Grande.....	Elephant Butte ¹⁰	Rubble concrete, gravity..	306	¹³ 1,155	¹⁴ 605,200
Do.....	Elephant Butte Dike. ¹⁰	Earth and rock fill.....	42	2,000	¹³ 179,000
Oregon:					
Umatilla.....	Cold Springs ¹⁰	do.....	98	3,800	789,500
Do.....	McKay ¹⁰	Gravel fill with concrete paving.	160	2,600	2,313,000
Oregon-California:					
Klamath.....	Clear Lake ¹⁰	Rock fill.....	33	790	56,600
Do.....	Link River ¹⁰	Concrete.....	22	435	2,200
Do.....	Gerber ¹⁰	Concrete arch.....	85	478	11,900
Do.....	Owyhee.....	Concrete arch gravity.....	405	835	525,000
Oregon-Idaho: Owyhee	Belle Fourche ¹⁰	Earth fill.....	122	6,200	1,600,000
South Dakota: Belle Fourche.					
Utah:					
Strawberry Valley.....	Indian Creek Dike. ¹⁰	Earth fill, reinforced concrete core wall.	38	1,311	101,170
Do.....	Strawberry Dam ¹⁰	do.....	72	488	108,420
Salt Lake Basin.....	Echo.....	Earth and rock fill.....	125	1,800	1,670,000

¹⁰ Completed.¹¹ Not designed.¹² Completed except permanent spillway.¹³ Including spillway and approaches, 1,675 feet.¹⁴ Including spillway, 618,536 cubic yards.¹⁵ Concrete pavement, 5,934 cubic yards.

RECLAMATION TABLES 11-14.—*Engineering data for projects on completion*—Con.

No. 12. STORAGE DAMS—Continued

Projects	Name	Type	Maximum height	Crest length	Volume
Washington:			<i>Feet</i>	<i>Feet</i>	<i>Cubic yards</i>
Okanogan.....	Salmon Lake ¹⁰	Earth embankment.....	40	1, 260	194, 290
Do.....	Conconully ¹⁰	Hydraulic earth fill.....	67	1, 000	352, 240
Yakima.....	Bumping Lake ¹⁰	Earth fill.....	45	3, 425	247, 700
Do.....	Cle Elum ¹⁰	Earth and gravel fill.....	125	700	462, 000
Do.....	Kachess ¹⁰	Rolled earth and gravel fill.....	63	1, 400	193, 300
Do.....	Tieton ¹⁰	Earth and rock fill, concrete core wall.....	222	905	1, 995, 000
Do.....	Keechelus ¹⁰	Rolled earth and gravel fill.....	70	6, 500	639, 000
Do.....	Clear Creek ¹⁰	Single concrete arch, gravity abutments.....	84	404	4, 100
Wyoming:					
Riverton.....	Pilot Butte No. 1 ¹⁰	Earth embankment.....	40	1, 350	133, 900
Do.....	Pilot Butte No. 2 ¹⁰	do.....	24	1, 150	50, 500
Do.....	Pilot Butte No. 3 ¹⁰	do.....	12	3, 400	19, 200
Do.....	Bull Lake.....	do.....	75	3, 300	600, 000
Shoshone.....	Shoshone ¹⁰	Rubble concrete arch.....	328	200	78, 580
Do.....	Ralston ¹⁰	Earth fill.....	50	2, 200	24, 740
Do.....	Deaver.....	do.....	14	1, 300	30, 300
Total.....					23, 822, 710

No. 13. DIVERSION DAMS

Arizona: Salt River.....	Granite Reef ¹⁰	Rubble concrete weir.....	38	1, 000	40, 000
Do.....	Power Canal ¹⁰	do.....	12. 75	400	8, 600
Do.....	Joint Head ¹⁰	Concrete weir.....	10	600	1, 740
Arizona-California: Yuma.....	Laguna ¹⁰	Indian weir, concrete and rock fill.....	40	4, 780	476, 030
California: Orland.....	South Canal ¹⁰	Concrete on piling, with rock fill.....	20	900	2, 890
Do.....	North Side ¹⁰	Concrete weir, with removable crest.....	8	360	270
Do.....	East Park Feed Canal. ¹⁰	Concrete arch.....	44	154	1, 780
Colorado:					
Grand Valley.....	Colorado River Diversion. ¹⁰	Concrete weir with rolling steel crest.....	24	546	25, 680
Uncompahgre.....	Gunnison ¹⁰	Crib with rock fill and movable flashboards.....	15. 75	237	3, 200
Do.....	Montrose and Delta. ¹⁰	Timber weir with concrete apron sluiceway and cut-off wall.....	6. 8	68. 5	170
Do.....	Loutsenhizer ¹⁰	Pile and timber weir.....	8	100	---
Do.....	Selig ¹⁰	Pile and timber weir with concrete sump.....	6	95. 5	200
Do.....	Ironston.....	Pile foundation with timber deck and needle flashboards.....	8. 5	58. 5	---
Do.....	East Canal ¹⁰	Pile and timber weirs, movable flashboards.....	(17)	144	---
Do.....	Garnet ¹⁰	Rock baskets, faced and surfaced with concrete.....	6. 5	75	500
Idaho:					
Boise.....	Boise River ¹⁰	Rubble concrete weir.....	45	18, 246	21, 750
Do.....	Black Canyon ¹⁰	Concrete masonry.....	183	1, 040	79, 840
Minidoka.....	Minidoka ¹⁰	Combined with diversion and storage dam (see Storage).	---	---	---
Montana:					
Milk River.....	Swift Current ¹⁰	Earth and rock fill timber crib.....	13	2, 800	86, 700
Do.....	St. Mary ¹⁰	Concrete.....	6. 5	198	480
Do.....	Chinook ¹⁰	do.....	---	---	---
Do.....	Dodson ¹⁰	Timber crib rock filled, concrete abutments, movable crest.....	25	319	12, 000
Do.....	Vandalia ¹⁰	Hollow reinforced concrete, automatic movable crest.....	34	1, 500	11, 600
Sun River.....	Sun River ¹⁰	Concrete arch.....	132	212	6, 200

¹⁰ Completed.¹⁶ Present development, rock-fill timber crib; height, 11 feet; volume, 1,500 cubic yards.¹⁷ Two weirs, one 6 by 72 feet, the other 6 feet 10 inches by 72 feet.¹⁸ Will be constructed by irrigation districts. No data available as to type and dimensions.

RECLAMATION TABLES 11-14.—*Engineering data for projects on completion—Con.*

No. 13. DIVERSION DAMS—Continued

Projects	Name	Type	Maximum height	Crest length	Volume
Montana-North Dakota: Lower Yellowstone.	Lower Yellow-stone. ¹⁰	Rock-filled timber weir	<i>Feet</i> 12	<i>Feet</i> 700	<i>Cubic yards</i> 14,500
Nebraska - Wyoming: North Platte.	Whalen ¹⁰ -----	Concrete weir with earth abutments.	35	300	144,860
Do-----	Horse Creek ¹⁰ -----	do-----	6	118	4,960
Nevada: Newlands-----	Truckee River ¹⁰ -----	16 concrete sluiceways-----	22	171	3,320
Do-----	Carson River ¹⁰ -----	23 concrete sluiceways-----	20	240	2,710
Do-----	Spanish Springs-----	Concrete overflow-----	22	250	2,140
New Mexico: Carlsbad-----	Avalon ¹⁰ -----	Combined storage and diversion (see storage).			
New Mexico-Texas: Rio Grande.	Leasburg ¹⁰ -----	Rubble concrete weir-----	10.8	600	2,640
Do-----	Mesilla Park ¹⁰ -----	do-----	16.7	303	2,880
Do-----	Mexican ²⁰ -----	Rubble masonry-----	4.7	320	1,200
Do-----	Percha ¹⁰ -----	Rubble concrete-----	17	350	4,350
Oregon:					
Umatilla-----	Feed Canal (Echo). ¹⁰	Concrete weir on timber crib.	2.5	400	300
Do-----	Maxwell Canal ¹⁰ -----	do-----	2.3	175	40
Do-----	Three-Mile Falls ¹⁰ -----	Concrete multiple arch.	24	800	4,160
Vale-----	Harper-----	{ Concrete gravity with earth and rock fill embankment.	30	700	{ 1,570 8,000
Oregon-California: Klamath.	Lost River ¹⁰ -----	Hollow reinforced concrete.	40	290	5,550
Do-----	Lower Lost River. ¹⁰	Reinforced concrete-----	15	204	630
Do-----	Malone ¹⁰ -----	Earth, with concrete spillway.	30	515	18,500
Do-----	Miller ¹⁰ -----	do-----	12	290	1,000
South Dakota: Belle Fourche.	Diversion ¹⁰ -----	Concrete weir-----	23	400	12,150
Utah:					
Strawberry Valley-----	Spanish Fork ¹⁰ -----	Reinforced concrete, ogee gravity section.	17	70	1,260
Do-----	Indian Creek Crossing. ¹⁰	Earth fill with clay-filled cut-off trench.	17	1,300	15,180
Salt Lake Basin-----	Weber-Provo-----	Closed concrete weir and dike.	20	150	(¹¹)
Washington:					
Okanogan-----	Salmon Creek ¹⁰ -----	Concrete weir-----	4	50	130
Yakima-----	Sunnyside ¹⁰ -----	Concrete ogee weir, earth dike.	8.5	500	2,290
Do-----	Tieton Diversion ¹⁰ -----	Concrete weir and rock-filled crib.	3	110	330
Do-----	Easton-----	Concrete gravity, with ogee river section.	65	248	5,500
Wyoming:					
Riverton-----	Wind River ¹⁰ -----	Concrete weir with earth embankment.	37	2,285	123,850
Shoshone-----	Corbett ¹⁰ -----	Reinforced concrete weir.	18	400	4,950
Do-----	Willwood ¹⁰ -----	Concrete gravity, with ogee weir section.	69.5	320	22,120
Total-----					1,189,500

¹⁰ Completed.¹¹ Not designed.²⁰ Constructed by Mexican authorities and used jointly.

RECLAMATION TABLES 11-14.—*Engineering data for projects on completion—Con.*

No. 14. IRRIGABLE AREA

State, project, and division	Public land			State land unsold	Indian land	Private land		Total
	Entered	Open	With-drawn			Rail-road unsold	Other	
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
Arizona: Salt River.....							245,940	245,940
Arizona-California: Yuma.....	14,298	3,913	34,433		7,853		51,237	111,734
Arizona—								
Valley.....	6,088		1,875		110		44,240	52,313
Mesa.....	2,166	3,913	32,124				6,797	45,000
California-Reservation.....	6,044		434		7,743		200	14,421
California: Orland-Main.....							20,733	20,733
Colorado:								
Grand Valley.....	13,530		8,855				28,115	50,500
Garfield gravity.....	11,530		5,355				15,115	32,000
Garfield pumping.....	2,000		3,500				3,000	8,500
Orchard Mesa pump- ing.....							10,000	10,000
Uncompahgre.....	12,874	1,939					60,841	75,654
Idaho:								
Boise.....	69,468		17,320	6,850			251,860	345,498
Arrowrock (Idaho).....	65,892			60			203,869	269,821
Arrowrock (Oregon).....	1,206						5,697	6,903
Notus.....							6,874	6,874
Hillcrest.....	1,000		2,000	1,000			10,100	14,100
Black Canyon.....	1,370		15,320	5,790			25,320	47,800
King Hill.....							16,553	16,888
Minidoka.....	94,794		148,127	9,527			63,137	315,585
Pumping.....	30,258			982			17,689	48,929
Gravity.....	64,536		1,287	705			5,448	71,976
North side pumping extension.....			106,840	7,840				114,680
Gravity extension unit.....			40,000				40,000	80,000
Montana:								
Huntley.....	26,213		2,553		244		3,497	32,507
Gravity.....	21,272		2,007		244		3,497	27,020
Pumping.....	4,941		546					5,487
Divisions—								
Pryor.....	23,549		1,889		66		2,912	28,416
Eastern.....	925		42		178		585	1,730
Fly Creek.....	1,739		622					2,361
Milk River.....	28,940		14,425	5,541			94,382	143,288
Chinook division ²²	1,941		1,608	1,198			50,733	55,500
Malta division.....	21,273		12,365	3,280			28,737	65,655
Glasgow division.....	5,726		452	1,063			14,892	22,133
Sun River.....	38,113		34,555	5,182			28,992	106,842
Sun River Slope.....	655		13,341	969			3,213	18,178
Big Coulee.....				356			1,934	2,290
Greenfields.....	22,071		18,768	3,640			20,184	64,663
Mill Coulee.....	4,197		1,543				2,160	7,900
Fort Shaw.....	11,190		903	217			1,501	13,811
Montana-North Dakota:								
Lower Yellowstone.....	9,869		2,169	798		39	46,474	59,349
Montana.....	4,625		1,086	658		39	32,620	39,028
North Dakota.....	5,244		1,083	140			13,854	20,321
Divisions—								
Gravity.....	9,708		2,169	565		39	44,560	57,041
Pumping.....	161			233			1,914	2,308
Nebraska-Wyoming:								
North Platte.....	56,682		3,075	3,352			174,080	237,189
Interstate division.....	41,681		1,536	644			100,589	114,450
Nebraska.....	10,964		1,317	644			98,635	111,560
Wyoming.....	717		219				1,954	2,890
Fort Laramie division.....	37,315		1,539	2,669			65,042	106,565
Nebraska.....	14,997		192	246			36,639	55,074
Wyoming.....	22,318		1,347	2,423			25,403	51,491
Northport division— Nebraska.....	7,686			39			8,449	16,174
Nevada:								
Newlands.....	29,308	554	17,512		4,877	7,500	30,249	90,000
Carson division.....	25,827	433	12,114		4,877	2,500	27,249	73,000
Truckee division.....	3,481	121	5,398			5,000	3,000	17,000
New Mexico: Carlsbad.....	45						25,010	25,055

²¹ Includes 416 acres of vested rights and 170 acres of school and town sites.²² Includes Savoy unit previously excluded.

RECLAMATION TABLES 11-14.—*Engineering data for projects on completion—Con.*

No. 14. IRRIGABLE AREA—Continued

State, project, and division	Public land			State land unsold	Indian land	Private land		Total
	Entered	Open	With-drawn			Rail-road unsold	Other	
New Mexico-Texas:	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
Rio Grande.....	550	-----	-----	200	-----	-----	154,250	155,000
New Mexico.....	550	-----	-----	200	-----	-----	87,250	88,000
Texas.....	-----	-----	-----	-----	-----	-----	67,000	67,000
Divisions—	-----	-----	-----	-----	-----	-----	-----	-----
Rincon.....	-----	-----	-----	50	-----	-----	16,950	17,000
Leasburg.....	300	-----	-----	100	-----	-----	30,650	31,000
Mesilla.....	250	-----	-----	-----	-----	-----	49,700	50,000
El Paso.....	-----	-----	-----	50	-----	-----	57,000	57,000
Oregon:	-----	-----	-----	-----	-----	-----	-----	-----
Umatilla.....	2,383	-----	2,376	-----	-----	3,319	14,353	22,431
East division.....	-----	-----	-----	-----	-----	1,407	9,724	11,131
West division.....	2,383	-----	2,376	-----	-----	1,912	4,620	11,300
Vale.....	2,600	1,100	-----	-----	-----	-----	27,300	31,000
Oregon-California: Klamath.....	15,867	321	19,101	-----	-----	-----	141,253	176,542
Oregon.....	3,070	-----	-----	-----	-----	-----	103,667	107,637
California.....	11,897	321	19,101	-----	-----	-----	37,586	68,905
Divisions—	-----	-----	-----	-----	-----	-----	-----	-----
Main.....	2,525	-----	-----	-----	-----	-----	39,025	41,550
Tule Lake.....	13,342	321	19,101	-----	-----	-----	236	33,000
Pumping.....	-----	-----	-----	-----	-----	-----	20,595	20,595
Langell Valley.....	-----	-----	-----	-----	-----	-----	21,497	21,497
Bonanza Springs.....	-----	-----	-----	-----	-----	-----	5,900	5,900
Lower Klamath Lake.....	-----	-----	-----	-----	-----	-----	54,000	54,000
Oregon-Idaho: Owyhee.....	27,000	-----	7,000	3,000	-----	-----	85,000	122,000
Idaho, complete supply.....	3,000	-----	7,000	-----	-----	-----	35,000	45,000
Oregon—	-----	-----	-----	-----	-----	-----	-----	-----
Complete supply.....	24,000	-----	-----	3,000	-----	-----	38,000	65,000
Supplemental right.....	-----	-----	-----	-----	-----	-----	12,000	12,000
South Dakota: Belle Fourche.....	36,312	-----	4,508	1,325	-----	-----	38,165	80,310
Utah:	-----	-----	-----	-----	-----	-----	-----	-----
Strawberry Valley.....	2,003	-----	-----	-----	-----	-----	51,886	53,889
High Line.....	2,003	-----	-----	-----	-----	-----	19,853	21,856
Spanish Fork.....	-----	-----	-----	-----	-----	-----	22,033	22,033
Springville-Mapleton.....	-----	-----	-----	-----	-----	-----	10,000	10,000
Salt Lake Basin.....	-----	-----	-----	-----	-----	-----	80,000	80,000
Washington:	-----	-----	-----	-----	-----	-----	-----	-----
Okanogan.....	116	-----	-----	-----	-----	-----	7,184	7,300
Gravity.....	-----	-----	-----	-----	-----	-----	-----	6,125
Pumping.....	-----	-----	-----	-----	-----	-----	-----	1,175
Yakima.....	7,358	-----	14,098	6,133	241	24,043	289,827	341,700
Sunnyside.....	2,627	-----	-----	30	241	-----	104,702	107,600
Tieton.....	2,048	-----	-----	4	-----	-----	29,948	32,600
Kittitas.....	-----	-----	5,400	1,600	-----	6,250	58,750	72,000
Roza.....	120	-----	1,523	2,067	-----	11,310	43,330	58,350
Moxee.....	1,663	-----	775	1,332	-----	2,783	30,197	36,750
Kennewick.....	900	-----	6,400	1,100	-----	3,700	22,900	35,000
Wyoming:	-----	-----	-----	-----	-----	-----	-----	-----
Riverton.....	-----	-----	69,000	-----	1,000	-----	30,000	100,000
Shoshone.....	55,223	13,556	109,403	3,906	-----	7,027	14,051	203,166
Montana, Frannie division.....	-----	-----	86	4	-----	-----	-----	90
Wyoming—	-----	-----	-----	-----	-----	-----	-----	-----
Garland division.....	37,377	382	1,688	252	-----	-----	2,362	42,061
Frannie division.....	14,829	586	10,264	337	-----	356	1,538	27,910
Willwood division.....	2,799	2,325	6,196	282	-----	-----	329	11,931
Heart Mountain division.....	218	10,263	38,582	1,958	-----	6,671	9,822	67,514
Oregon Basin division.....	-----	-----	52,587	1,073	-----	-----	-----	53,660
Total.....	543,546	21,383	508,510	46,149	14,215	41,928	2,074,369	3,250,100

* Includes some public land, but distribution not known.

RECLAMATION TABLE 15.—Summary of construction results to June 30, 1929

Items	To June 30, 1929		To June 30, 1928		Increase	
Reservoir capacity available (original).....	<i>Acre-feet</i> 12, 881, 963		<i>Acre-feet</i> 12, 829, 523		<i>Acre-feet</i> 52, 440	
CANALS, DITCHES, AND DRAINS	<i>Miles</i>		<i>Miles</i>		<i>Miles</i>	
Canals over 800 second-feet capacity	564. 8		546. 5		18. 3	
Canals 301 to 800 second-feet capacity	729. 1		715. 8		13. 3	
Canals 50 to 301 second-feet capacity	2, 334. 8		2, 324. 3		10. 5	
Canals less than 50 second-feet capacity	9, 469. 1		9, 449. 1		20. 0	
Total canals.....	13, 097. 8		13, 035. 7		62. 1	
Waste-water ditches.....	1, 084. 0		1, 061. 2		22. 8	
Drains, open.....	2, 146. 4		2, 042. 4		104. 0	
Drains, closed.....	229. 2		225. 8		3. 4	
Total.....	3, 459. 6		3, 329. 4		130. 2	
Grand total.....	16, 557. 4		16, 365. 1		192. 3	
TUNNELS						
Number.....	122		118		4	
Length (feet).....	175, 536		164, 083		11, 453	
STORAGE AND DIVERSION DAMS	<i>Cubic yards</i>		<i>Cubic yards</i>		<i>Cubic yards</i>	
Masonry.....	2, 813, 740		2, 716, 103		97, 637	
Earth.....	16, 458, 599		16, 092, 473		366, 126	
Rock-fill and crib.....	2, 120, 236		2, 074, 733		45, 503	
Total.....	21, 392, 575		20, 883, 309		509, 266	
DIKES AND LEVEES						
Length and volume.....	<i>Feet</i> 1, 285, 691	<i>Cubic yards</i> 6, 865, 765	<i>Feet</i> 1, 249, 122	<i>Cubic yards</i> 6, 717, 359	<i>Feet</i> 36, 569	<i>Cubic yards</i> 148, 396
	Concrete	Wood	Concrete	Wood	Concrete	Wood
CANAL STRUCTURES	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>
Costing over \$2,000.....	1, 553	249	1, 540	242	13	7
Costing \$500 to \$2,000.....	3, 532	1, 068	3, 465	1, 052	67	16
Costing \$100 to \$500.....	18, 837	11, 358	18, 520	11, 182	317	176
Costing less than \$100.....	32, 926	78, 939	32, 353	77, 810	573	1, 129
Total.....	56, 848	91, 614	53, 878	90, 286	970	1, 328
Grand total.....	148, 462		146, 164		2, 298	
BRIDGES	<i>Number</i>	<i>Length</i>	<i>Number</i>	<i>Length</i>	<i>Number</i>	<i>Length</i>
Steel.....	112	<i>Feet</i> 9, 124	112	<i>Feet</i> 9, 124	0	<i>Feet</i> 0
Combination.....	441	13, 371	434	13, 020	7	351
Wood.....	10, 669	249, 413	10, 390	242, 091	279	7, 322
Concrete.....	409	5, 541	396	5, 285	13	256
Total.....	11, 631	277, 449	11, 332	269, 520	299	7, 929
CULVERTS						
Concrete.....	3, 864	204, 235	3, 720	194, 078	144	10, 157
Metal.....	3, 550	127, 630	3, 211	114, 289	339	13, 341
Terra cotta.....	2, 129	84, 716	2, 115	84, 048	14	668
Wood.....	4, 500	118, 815	4, 475	117, 364	25	1, 451
Total.....	14, 043	535, 396	13, 521	509, 779	522	25, 617
PIPE	<i>Linear feet</i>		<i>Linear feet</i>		<i>Linear feet</i>	
Concrete.....	1, 110, 236		1, 062, 079		48, 157	
Metal.....	448, 315		401, 601		46, 714	
Terra cotta (tile).....	1, 822, 703		1, 757, 788		64, 915	
Wood.....	709, 842		709, 842		0	
Total.....	4, 091, 096		3, 931, 310		159, 786	

RECLAMATION TABLE 15.—*Summary of construction results to June 30, 1929—*
Continued

Items	To June 30, 1929		To June 30, 1928		Increase	
	Number	Length	Number	Length	Number	Length
FLUMES						
Concrete.....	126	<i>Feet</i> 78,696	104	<i>Feet</i> 73,448	22	<i>Feet</i> 5,248
Metal.....	1,974	238,400	1,897	234,643	77	3,757
Wood.....	2,711	535,926	2,692	534,838	19	1,088
Total.....	4,811	853,022	4,693	842,929	118	10,093
CANALS LINED						
	Concrete	Wood	Concrete	Wood	Concrete	Wood
Length (miles).....	485.4	4.1	470.8	4.1	14.6	0.0
Total.....	489.5		474.9		14.6	
BUILDINGS						
	<i>Number</i>		<i>Number</i>		<i>Number</i>	
Offices.....	101		101		0	
Residences.....	731		731		0	
Power plants.....	35		35		0	
Pumping stations.....	238		236		2	
Barns, storehouses, etc.....	575		575		0	
Total.....	1,680		1,678		2	
WELLS						
	Number	Depth	Number	Depth	Number	Depth
Number and depth.....	692	<i>Feet</i> 73,415	688	<i>Feet</i> 72,853	4	<i>Feet</i> 562
COMMUNICATIONS						
	<i>Miles</i>		<i>Miles</i>		<i>Miles</i>	
Roads.....	1,203.4		1,089.5		113.9	
Railroads.....	110.3		87.9		22.4	
Telephone lines.....	3,350.3		3,350.3		0	
Transmission lines.....	2,056.0		1,914.9		141.1	
Total.....	6,720.0		6,442.6		277.4	
POWER DEVELOPED						
	<i>Horsepower</i>		<i>Horsepower</i>		<i>Horsepower</i>	
Water and steam.....	166,128		166,103		25	
EXCAVATION						
	<i>Cubic yards</i>		<i>Cubic yards</i>		<i>Cubic yards</i>	
Class 1, earth.....	248,365,612		240,665,663		7,699,949	
Class 2, indurated material.....	15,961,312		14,482,633		1,478,679	
Class 3, rock.....	12,495,576		11,677,836		817,740	
Total.....	276,822,500		266,826,132		9,996,368	
Riprap (cubic yards).....	2,522,787		2,515,400		7,387	
Paving (square yards).....	1,080,328		1,068,994		11,334	
Concrete (cubic yards).....	4,191,553		4,011,800		179,753	
Cement (barrels).....	4,664,450		4,429,427		235,023	
Gunite (square yards).....	898,096		754,868		143,228	

RECLAMATION TABLE 16.—Power plants operated on Bureau of Reclamation projects during fiscal year 1928-29

Project	Name of plant	Outgoing line voltage	Plant capacity (kv-a)	Number of units	Head in feet	First cost of plant	Cost of operation and maintenance	Estimated depreciation	Cost per kilowatt-hour, exclusive of depreciation	Distribution of kilowatt-hours generated				Total output, kilowatt-hour	Gross power sales
										Sold to consumers	Irrigation and drainage requirements	Used for other purposes	Losses		
Boise	Black Canyon ¹	2 66,000	10,000	2	82-92	414,317.21	14,254.15	15,290.99	\$0.000342	Entire output delivered to Idaho Power Co.				41,710,205	58,546.46
Minidoka	Boise River ²	22,000	1,875	3	25-30	167,905.37		5,000.00		Entire output leased to Idaho Power Co.				2,740	4,000.00
	Minidoka	33,000	10,000	6	47.7	645,921.03	23,654.85	19,250.00	.0000455	21,718,080.27, 234,771				51,988,000	128,158.56
	American Falls (2 plants) ⁴	33,000	1,540	3	36 and 45	\$ 76,975.00		5,040.00		Not operated during fiscal year.					
Newlands ³	Lahontan ³	33,000	1,875	3	20-110	141,886.01	{ Income-	4,260.00							
North Platte	Guersey	33,000	6,000	2	Variable	878,968.11	54,187.81	55,200.00	.00248						
	Lingle	33,000	1,750	4	107										
Okanogan	Power plant No. 1	6,600	187	1	108	11,923.44	{ Not operated during year.								
	Power plant No. 2	6,600	187	1	55	13,931.42									
Rio Grande	Elephant Butte	2,300	150	1	18-180	8,440.50	1,963.96	None.	.038					51,200	
Riverton Salt River ⁵	Pilot Butte No. 2	33,000	1,000	1	103	163,869.99	16,281.15	15,810.89	.00823					1,978,180	13,599.31
	Arizona Falls	10 11,000	1,050	2	19	109,500.73	8,565.12	5,475.00	.00323					7 2,654,350	
	Chandler	11,000	600	1	40	91,990.84	7,456.34	4,690.00	.00316					2,360,980	
	Cross Cut	10 11,000	5,250	6	111	755,147.29	30,710.39	37,750.00	.00290					10,605,500	
	Roosevelt	110,000	19,250	7	80-240	1,235,894.58	59,217.53	61,850.00	.00243					24,405,000	2,406,479.62
	So. Consolidated	40,000	2,000	2	34	103,139.60	9,674.85	8,160.00	.00140					6,900,200	
Shoshone Valley ⁶	Mormon Flats	110,000	8,750	1	60-150	482,767.80	14,833.84	24,130.00	.00040					37,126,000	
	Horse Mesa	110,000	33,300	3	265	5,341,896.54	33,833.80	267,000.00	.00028					122,110,000	
	Shoshone	33,000	2,000	2	225	567,698.96	9,036.12	16,914.00	.00205					4,408,840	52,614.27
Strawberry Valley ⁷	Spanish Fork	11,000	1,000	2	123.5	60,904.50	19,342.33	3,045.23	.01008					1,917,440	32,358.37
Yakima	Rocky Ford	6,600	187	1	73	23,000.00	2,671.63	1,056.40	.004					655,400	
Sunnyside ⁸	Siphon Drop	33,000	2,000	2	9.27	317,936.00	\$ 13,865.00	13,248.00	.00194					7 7,496,418	59,526.54

¹ Operated entire fiscal year.² 6,600-volt generators; all others 2,300 volts.³ Operated for stand-by service only.⁴ Operated for stand-by service only.⁵ Estimated.⁶ Leased to Canyon Power Co. for 10-year period.⁷ Includes purchased power.⁸ Second unit under construction.⁹ Operated by irrigation district or Water Users' Association.¹⁰ 11,000-volt generators; all others 2,300 volts.

RECLAMATION TABLE 17.—Pumping plants operated on Bureau of Reclamation projects during fiscal year 1928-29

Project	Name of plant	Type of units	Plant capacity		Num-ber of units	Static lift Feet	First cost of plant	Cost of operation and main- tenance	Estimated deprecia- tion	Energy used for pumping Kilowatt- hours	Acre-feet pumped	Cost per acre- foot without depreciation	
			Horse power	Sec- ond- foot								Per acre foot	Per foot lit
Boise Grand Valley Hundley Klamath	Black Canyon	V. T. D. S.	1,244	266	2	25	\$149,901.39	\$1,558.54	\$6,621.96	95,555	95,555	\$0.01631	\$0.00065
	Price Stub	V. T. D. C.	125	28	1	31	46,697.83	445.78	1,000.00	4,550	4,550	.068	.00317
	Ballantine	do	620	60	2	43	73,853.32	1,253.10	2,000.00	16,143.90	16,143.90	.078	.00173
	Ballantine auxiliary	O. F. D. C.	400	46	2	43	71,103.56	513.09	3,500.00	160	160	3.20	.071
	Dry Lake	V. T. D. C.	73	19.3	1	51	31,861.11	175.00	1,200.00	15,780	3,475	.053	.00104
Lower Yellow- stone, Middoka	Dry Lake No. 1	V. M. D. S.	120	60	2	3.1	341,529.60	3,672.66	2,000.00	306,440	18,969	.194	.041
	Tule Lake No. 2	do	60	30	1	3.5	49,970.43	235.98	1,000.00	---	4,218	.056	.00187
	Tule Lake No. 3	do	85	42	2	4.1	---	---	---	---	---	---	---
	Thomas Point	H. T. D. C.	220	45	2	31	186,020.00	28,944.07	---	10,810,800	231,400	.053	.00179
	Pumping plant No. 1	V. M. D. C.	3,800	825	5	29	184,920.00	---	---	9,340,000	195,332	---	---
Newlands North Platte Okanogan Salt River	Pumping plant No. 2	do	3,280	700	4	30.7	103,107.00	---	---	5,672,200	116,824	---	---
	Pumping plant No. 3	do	1,900	417	3	29.9	32,947.72	---	---	632,600	20,885	---	---
	Boersch Lake	do	200	50	2	20.0	18,745.61	---	---	480,740	---	---	---
	West End	H. M. D. C.	150	40	2	21.25	3,328.43	---	---	25,500	---	---	---
	A-4 pumping station	Scoop wheel	25	20	1	3.5	3,634.71	---	---	10,580	---	---	---
	C-2 pumping station	do	10	11	1	4.8	---	---	---	---	---	---	---
	1817 pumping station	do	10	11	1	2.5	2,803.97	8,350.05	---	11,018	10,252	---	---
	114 pumping station	H. M. D. C.	7.5	4	1	7.0	1,008.76	---	---	31,170	---	---	---
	1812 pumping station	do	7.5	2	1	4.0	864.77	---	---	13,458	---	---	---
	MacRae pumping station	do	15	4	1	14.0	1,696.56	---	---	31,060	---	---	---
	D-2 pumping station	do	15	4	1	14.0	17,011.91	---	---	177,608	---	---	---
	Three drainage plants	do	45	17	3	13.0	---	---	---	---	---	---	---
	Lahontan	do	400	60	2	54.1	36,289.62	(¹)	---	---	---	---	---
Salt River	Dutch Flats drainage pumps	V. M. D. C.	100	8	3	30-52	23,393.94	3,064.00	1,500.00	115,968	846	3.62	.084
	Duck Lake	H. M. D. C.	125	10	2	56-79	17,201.92	3,148.20	---	---	1,472	0.78	.011
	Government wells No. 1 and 2	V. M. D. C.	30	2	2	51.25	18,583.21	---	---	---	---	---	---
	Robinson Flat	H. M. D. C.	400	12	2	188	20,077.24	3,418.35	---	---	1,957	2.35	.013
	Salmon Lake	G. E. D. C.	275	18	1	27-26	17,842.16	(²)	---	---	---	---	---
Salt River	Dobbins pumping plant	V. M. D. C.	75	4	1	68.3	3,301.85	---	21.12	Plant did not operate during year	20,020	1.43	.0352
	Chandler division	H. M. D. C. and V. M. D. S.	820	91.96	11	40.75	148,054.21	31,066.55	10,365.89	1,944,555	20,020	1.43	.0352

¹ Operated by districts or water user's association.² Includes cost of moving 10-inch pump from Plant No. 2 to Plant No. 3, and temporary installation of 24-inch pump at Plant No. 2.³ Incomplete cost.⁴ Not operated.

RECLAMATION TABLE 17—Pumping plants operated on Bureau of Reclamation projects during fiscal year 1928-29—Continued

Project	Name of plant	Type of units	Plant capacity		Num-ber of units	Static lift	First cost of plant	Cost of operation and main-tenance	Estimated deprecia-tion	Energy used for pumping	Acre-foot pumped	Cost per acre-foot without depreciation	
			Horse power	Sec-ond-foot								Per acre foot	Per foot lift
Yakima-Sunny-side, ¹	High line	H. M. D. C.	900	105	4	Fixed	\$86,656.83	\$36,302.45	\$4,551.94	Kilowatt-hours 2,611,750	27,195	\$1.33	\$0.0267
	Tempe pumping plant	do	150	13	1	50	5,729.84	12,308.90	401.09	746,138	6,677	1.84	.0368
	Mesa division	V. M. D. C. and S.	2,030	185.17	25	49.78	205,192.63	121,107.38	14,363.48	7,718,381	66,655	1.82	.0365
	Laveen division	do	70	3.2	3	52.44	18,328.45	8,254.65	1,282.99	152,665	1,192	6.92	.132
	Phoenix division	do	1,970	113.59	48	66.85	253,460.40	112,596.82	17,742.23	6,807,274	42,230	2.66	.0399
	Tempe division	H. and V. M. D. S.	1,480	165.14	20	46.46	130,323.80	87,991.87	9,122.66	5,831,734	70,282	1.25	.0269
	Salt River division	V. M. D. C. and S.	950	160.16	421	38.72	143,033.45	47,565.63	10,112.34	2,845,544	36,513	1.30	.0336
	San Francisco	H. M. D. C.	50	3	1	50	29,978.90	2,756.91	2,997.89	185,878	991	2.78	.0556
	Tolleson division	Combined with Salt River division	75	12	1	36.08	12,444.24	2,665.19	871.10	300,475	4,655	.5725	.0159
	Maricopa Garden Farm	V. M. D. C.	125	15	1	25	9,053.72	2,037.04	633.76	100,963	1,297	1.586	.0634
	New States Canal	H. M. D. C.	250	100	2	20	23,000.00	6,005.03	1,610.00	350,316	8,015	.7492	.0374
	Joint Head booster pump	V. M. D. C.	8	4	1	8	1,000.00	94.88	70.00	8,030			
	Fifteenth Avenue booster pump	H. M. D. C.	365	36.5	3	35 and 78	72,500.00	2,827.37	3,120.00		11,742	.241	.0037
	Grandview	1 V. T. D. C.; 2 H. M. D. C.	35	1.56	1	103	5,800.00	255.86	300.00		300	.85	.008
Yuma	Hillcrest	V. T. D. C.	800	48	2	110	1,065.00	75.00	68.71		105	.71	.0142
	Little Snipes Mountain	V. T. D. C.	800	48	2	110	92,000.00	3,185.16	2,480.00		14,711	.216	.00196
	Outlook	H. T. D. C.	190	12	1	105	31,968.00	1,090.43	1,500.00		3,264	.00318	.00318
	Prosser	V. T. D. C.	850	22	3	200	78,000.00	3,055.76	1,800.00		6,222	.49	.0024
	Snipes Mountain	V. T. D. C.	160	11.6	1	90	28,056.00	1,129.69	1,500.00		3,633	.310	.00344
	Spring Creek	H. T. D. C.	1,100	105	3	71	159,936.24	58,707.23	4,000.00	5818,100	56,251	1.39	.02
	B-Lift	1 V. M. D. C.; 2 H. M. D. C.	130	56	2	3.79	6,775.00	52,320.00	325.00	68,165	52,786	.832	.203
	Reservation	G. E. D. C.	525	300	3	12.44	108,770.00	514,770.00	4,219.00	1,139,500	54,976	.268	.022
	Valley Drainage	1 O. E. D. S.; 2 H. M. D. S.	20	46	1	7	1,800.00	579.44	90.00	7,544	117.63	.67	.096
	West Yuma	H. M. D. C.								4,567			

¹ Operated by districts or water user's association.² Additional units under construction.³ Estimated.⁶ Gallons of gasoline.⁷ Gallons of fuel-oil.

RECLAMATION TABLE 18.—*Estimate of seepage and summary of drainage work to June 30, 1929*

State and project	Constructed drains ¹		Estimated area damaged by seepage on June 30, 1928	Estimated area protected by constructed drains	Estimated area that will be protected when all drains authorized have been constructed
	Open	Closed			
	Miles	Miles	Acres	Acres	Acres
Arizona, Salt River 2 3-----	15.85	5.30	-----	60,000	60,000
Arizona-California:					
Yuma Reservation-----	11.70	4.00	-----	8,000	8,000
Yuma Valley-----	45.06	-----	2,000	34,500	50,000
Colorado:					
Grand Valley—					
Project lands-----	48.17	.48	200	6,600	7,000
Grand Valley drainage districts-----	38.30	1.00	29,000	10,000	10,000
Teller Institute-----	2.80	-----	-----	300	300
Frey drain-----	1.60	-----	-----	300	300
Orchard Mesa-----	14.38	.24	50	2,200	2,200
Uncompahgre 4-----	4.00	98.00	17,000	10,500	10,500
Idaho:					
Boise—					
Riverside district-----	44.50	-----	400	11,400	11,400
Pioneer district-----	78.50	.40	800	30,000	30,000
Nampa and Meridian district-----	45.80	-----	1,400	51,000	51,000
Project lands-----	94.60	.30	800	29,200	31,200
King Hill 2-----	.88	-----	180	800	800
Minidoka—					
Gravity division-----	125.00	-----	1,300	30,100	30,100
Pumping division-----	7.20	-----	2,800	1,800	2,800
Montana:					
Huntley-----	24.29	52.40	560	23,000	⁵ 23,560
Milk River—					
Malta division-----	.50	.10	2,700	300	300
Glasgow division-----	1.20	.50	300	200	200
Sun River—					
Fort Shaw division-----	-----	-----	3,997	-----	-----
Greenfields division-----	27.80	-----	200	15,600	15,600
Montana-North Dakota: Lower Yellowstone-----	53.00	1.10	7,500	6,200	12,500
Nebraska-Wyoming:					
North Platte 2—					
Interstate division-----	41.84	12.42	2,500	8,000	8,000
Do. ⁶ -----	57.10	-----	-----	-----	-----
Fort Laramie division-----	71.63	-----	1,000	21,000	21,000
Do. ⁷ -----	67.08	-----	-----	-----	-----
Northport division-----	8.42	-----	250	2,500	2,500
Nevada:					
Newlands 2—					
Carson division-----	224.16	3.99	500	89,800	⁸ 103,392
Truckee division-----	18.84	-----	50	6,080	⁸ 6,080
New Mexico: Carlsbad-----	12.88	3.65	4,500	6,200	6,200
New Mexico-Texas:					
Rio Grande—					
Rincon division-----	40.21	-----	2,000	16,000	17,000
Leasburg division-----	67.60	-----	3,000	30,700	31,000
Mesilla division-----	136.09	-----	9,000	47,500	50,000
El Paso division-----	158.18	-----	9,000	52,500	57,000
Oregon:					
Umatilla 2-----	14.30	.20	1,200	3,500	3,500
Vale-Warm Springs I district-----	56.85	-----	-----	19,790	19,790
Oregon-California:					
Klamath—					
Main division-----	105.00	8.00	11,800	29,600	38,000
Tule Lake division-----	84.00	-----	-----	13,900	33,000
Langell Valley division-----	16.00	-----	600	6,800	6,800
South Dakota: Belle Fourche-----	43.30	-----	10,000	7,200	15,000
Utah: Strawberry Valley 2 4-----	18.90	71.50	8,500	11,422	19,922

¹ Surface drains and waste ditches not included.² Projects being operated by water users or districts who have not furnished data to June 30, 1928. Data shown are from last report.³ Drainage largely by pumps, water recovered being used for irrigation purposes.⁴ Constructed by landowners, water users, or drainage districts.⁵ It is the plan of the district to extend and improve the present drainage system to relieve the present seepage area.⁶ Outlet channels, of which 29.08 miles built by United States partly under cooperative contracts, 21.67 miles by Farmers Irrigation district, 2 miles by Morrill drainage district, and 4.35 miles by drainage district No. 1.⁷ Outlet channels, of which 56.68 miles built by United States as part of canal wasteway and drainage system and 10.4 miles by United States under cooperative contract with the Gering irrigation district.⁸ Area benefited.

RECLAMATION TABLE 18.—*Estimate of seepage and summary of drainage work to June 30, 1929—Continued*

State and project	Constructed drains		Estimated area damaged by seepage on June 30, 1928	Estimated area protected by constructed drains	Estimated area that will be protected when all drains authorized have been constructed
	Open	Closed			
Washington:					
Yakima—	<i>Miles</i>	<i>Miles</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
Sunnyside division ⁹	83. 14	92. 69	9, 000	51, 890	51, 890
Tieton division ⁹	7. 50	2. 30	200	2, 400	2, 400
Wyoming:					
Riverton.....	6. 16	-----	10	4, 550	4, 550
Shoshone—					
Garland division.....	130. 62	124. 87	1, 500	36, 500	39, 000
Frannie division.....	84. 36	-----	1, 000	11, 500	11, 500
Willwood division.....	11. 14	-----	-----	3, 000	10, 000
Total.....	2, 250. 43	483. 44	145, 797	814, 332	915, 284

⁹ All drainage work done by county drainage engineer through drainage improvement districts.

RECLAMATION TABLE 19.—Settlement and economic data, 1928

	Irrigated farms		Towns		Number of schools	Number of churches	Banks			
	Number	Population	Number	Population			Number	Capital stock	Deposits	Number of depositors
Arizona: Salt River.....	8,300	50,000	12	80,000	70	68	15	\$1,600,000	\$35,000,000	50,700
Arizona-California: Yuma.....	1,731	3,637	5	10,100	14	25	3	215,000	2,725,700	7,635
California: Orland.....	695	1,812	1	1,700	10	8	2	135,000	1,293,400	3,450
Colorado: Grand Valley.....	416	1,230	6	15,040	24	32	4	365,000	4,000,000	9,000
Uncompahgre.....	1,770	5,741	3	7,400	27	27	6	514,300	3,872,700	11,250
Idaho: Boise.....	3,797	10,170	16	47,670	55	79	15	2,195,000	26,750,000	35,000
King Hill.....	185	546	3	1,285	5	5	1	20,000	300,000	900
Minidoka.....	2,287	8,420	6	8,595	23	40	5	200,000	2,368,500	5,050
Montana: Huntley.....	586	1,765	5	682	8	8	1	25,000	200,000	500
Milk River.....	382	1,346	17	8,595	32	35	11	435,000	6,083,600	10,205
Sun River.....	268	891	4	416	10	10	2	51,000	174,000	615
Montana-North Dakota: Lower Yellowstone.....	420	856	8	3,035	17	19	5	140,000	1,032,000	2,775
Nebraska-Wyoming: North Platte.....	2,851	9,002	18	26,030	102	61	16	500,000	6,263,900	19,400
Nevada: Newlands.....	681	2,500	5	2,700	13	9	1	75,000	1,230,400	1,800
Nevada: Carlsbad.....	425	2,307	4	5,000	8	11	1	80,000	1,000,000	1,800
New Mexico: Rio Grande.....	4,728	22,538	37	144,076	82	122	10	2,300,000	33,623,600	37,160
Oregon: Umatilla.....	288	805	2	1,055	4	4	1	25,000	265,000	1,200
Eastern division.....	168	500	3	600	3	3				
Western division.....	624	2,351	5	15,025	34	15	6	637,000	6,687,000	14,000
Oregon-California: Klamath.....	876	2,165	4	4,795	28	9	4	160,000	3,061,000	5,000
South Dakota: Belle Fourche.....	2,751	6,950	12	18,900	27	26	5	235,000	1,750,000	8,350
Utah: Strawberry Valley.....	383	991	3	3,500	6	8	3	125,000	1,429,000	2,500
Washington: Okanogan.....	3,467	10,142	11	8,475	42	31	9	260,000	2,399,000	7,423
Yakima.....	1,380	3,907	8	27,825	11	4				
Sunnyside.....	1,355	1,065	5	9,500	24	16	6	375,000	5,195,100	9,400
Tieton.....										
Kititas.....										
Wyoming: Riverton.....	14	36	4	2,220	3	8	1	50,000	485,000	1,000
Shoshone.....	860	1,989	5	1,572	5	9	3	70,000	535,000	2,260
Total.....	40,788	153,663	212	451,811	687	689	136	8,846,300	147,732,900	248,373

RECLAMATION TABLE 20.—*Irrigation and crop results, Government reclamation projects, 1928*¹

State and project	Lands in projects covered by crop census				Other lands served by Government works, usually by a partial water supply through private canals under Warren Act or other water service contracts					
	Irrigable acreage ²	Irrigated acreage	Cropped acreage	Crop value		Irrigable acreage	Irrigated acreage	Cropped acreage	Crop value	
				Total	Per acre				Total	Per acre
Arizona: Salt River.....	245,940	324,940	219,970	\$26,082,055	\$118.57	68,170	61,000	61,000	\$6,547,130	\$107.33
Arizona-California:										
Yuma.....	63,700	53,700	53,100	4,831,705	90.98					
Yuma Auxiliary (Mesa).....	2,445	1,040	480	75,350	157.23	230	220	140	32,840	232.88
California: Orland.....	20,730	14,465	13,310	759,380	57.07					
Colorado:										
Grand Valley.....	30,400	14,960	13,340	552,715	38.47	18,400	13,400	13,000	1,802,000	138.60
Uncompahgre.....	75,650	60,820	60,750	2,265,100	37.29	1,650	1,550	1,545	38,070	24.64
Idaho:										
Boise.....	171,450	160,975	149,260	4,938,040	33.08	145,200	130,200	125,700	4,485,000	35.68
King Hill.....	8,000	6,525	6,230	176,620	28.33					
Minidoka.....	120,905	104,580	98,495	3,321,720	33.72	798,290	683,310	649,090	28,377,840	43.70
Gravity division.....	71,975	59,500	55,730	1,842,630	33.07					
Pumping division.....	48,930	45,080	42,765	1,479,090	34.59					
Montana:										
Huntley.....	32,500	20,800	21,800	698,430	32.04					
Milk River.....	72,455	15,830	15,820	211,195	13.35	43,950	22,360	22,360	473,190	21.16
Sun River.....	55,875	14,080	24,800	388,210	16.00					
Fort Shaw division.....	13,900	6,220	6,930	111,920	16.15					
Greenfield's and Big Coulee division.....	41,975	7,860	17,870	276,290	15.46					
Montana-North Dakota: Lower Yellowstone.....	58,250	19,770	19,770	499,450	25.27					
Nebraska-Wyoming: North Platte.....	236,410	192,290	185,650	5,455,210	29.38	127,535	106,635	103,085	4,205,375	40.79
Pathfinder irrigation district.....	113,670	89,890	89,890	2,450,790	27.26					
Gering and Fort Laramie irrigation district.....	55,075	34,360	48,260	1,653,380	33.84					
Goshute irrigation district.....	51,490	36,260	36,260	1,115,080	30.75					
Northport irrigation district.....	16,175	11,780	11,240	235,960	20.99					
Nevada: Newlands.....	87,500	49,970	46,085	1,773,200	38.50					
New Mexico: Carlsbad.....	25,280	25,280	23,820	1,291,160	54.21					
New Mexico-Texas: Rio Grande.....	152,420	143,320	139,600	12,733,650	91.22	48,970	48,970	48,970	2,431,620	48.02
Oregon: Umatilla.....	18,730	11,395	11,040	242,740	21.98	590	520	495	18,323	37.00
Oregon-California: Klamath.....	53,560	46,530	43,450	1,270,300	28.00	63,630	35,705	35,515	557,730	15.70
Main division.....	41,550	36,730	36,610	1,041,590	28.45					
Tule Lake division.....	12,010	9,800	8,840	228,710	23.85					
South Dakota: Belle Fourche.....	74,500	35,910	46,700	1,173,370	25.13					
Utah: Strawberry Valley.....	41,805	39,395	38,850	1,202,115	30.94	7,400	7,010	6,990	184,000	26.32

Washington:	7, 150	4, 150	3, 600	1, 092, 725	303. 73	166, 720	124, 140	124, 140	13, 342, 200	107. 00
Okanogan	133, 635	115, 935	103, 140	8, 242, 930	79. 92					
Yakima	102, 820	88, 835	80, 850	5, 467, 160	67. 58					
Sunnyside division	31, 115	27, 100	22, 230	2, 773, 770	124. 75					
Tieton division										
Wyoming:										
Shoshone	73, 640	43, 830	42, 980	954, 760	22. 21					
Garland division	41, 650	35, 030	34, 300	792, 080	23. 10					
Frankie division	20, 060	7, 640	7, 580	151, 710	20. 00					
Willwood division	11, 930	1, 160	1, 100	10, 960	9. 93					
Riverton	20, 000	1, 580	520	6, 670	12. 95					
Total with irrigation	1, 882, 930	1, 442, 080	1, 385, 560	80, 238, 800	57. 91	1, 490, 735	1, 235, 020	1, 192, 030	62, 495, 320	52. 43
Cropped without irrigation:										
Milk River			19, 100	191, 330	10. 02					
Sun River			12, 970	193, 140	10. 50					
Lower Yellowstone			16, 880	208, 800	12. 37					
Klamath			54, 730	245, 620	4. 45					
Total cropped without irrigation			103, 680	838, 950	8. 09					
Grand total	1, 882, 930	1, 442, 080	1, 489, 240	81, 077, 750	54. 41	1, 490, 735	1, 235, 020	1, 192, 030	62, 495, 320	52. 43

¹ Data are for calendar year (irrigation season) except in Salt River project where data are for corresponding "agricultural year," October, 1927, to September, 1928.

² Area for which bureau was prepared to supply water.

³ Includes 20,000 acres reported as vacant, 2,414 acres of "home tracts," and 3,548 acres on which no crops were reported.

⁴ Includes dry farm tracts irrespective of the figures given below under "cropped without irrigation."

RECLAMATION TABLE 21.—*Summary of crop results on reclamation projects in 1928*¹

NOTE.—These figures are limited to crops covered by census on Government projects proper, excluding all crops in areas served with water under the Warren Act, but including nonirrigated crops grown on the projects.

Crop	Acreage cropped		Yields		Crop value		
	Total	Per cent of cropped	Total	Average per acre	Average per acre	Total	Per cent of total value of all crops
Cereals:			<i>Bushels</i>				
Barley.....	70, 149	4.7	2, 330, 980	33.2	\$19.61	\$1, 375, 817	1.7
Corn.....	47, 940	3.2	1, 283, 050	26.7	20.70	991, 926	1.2
Oats.....	39, 546	2.6	1, 413, 229	35.7	14.61	577, 981	.7
Rye.....	3, 701	.3	67, 703	18.2	16.00	59, 086	-----
Wheat.....	178, 470	12.0	4, 762, 711	26.7	25.61	4, 571, 620	5.6
Total.....	339, 806	22.8	9, 857, 673	29.0	22.30	7, 576, 430	9.3
Other grain and seed:							
Alfalfa seed.....	20, 348	1.3	87, 312	4.2	37.10	755, 911	.9
Clover seed.....	23, 825	1.6	82, 285	3.4	42.51	1, 012, 903	1.2
Flax seed.....	1, 112	.1	9, 338	8.4	15.61	17, 365	-----
Total.....	45, 285	3.0	178, 935	3.9	39.44	1, 786, 179	2.2
Hay and forage:			<i>Tons</i>				
Alfalfa hay.....	436, 488	29.3	1, 274, 087	2.9	36.46	15, 915, 058	19.6
Clover hay.....	18, 667	1.2	24, 567	1.3	11.91	222, 470	.3
Other hay.....	27, 799	1.9	28, 736	1.0	8.90	247, 468	.3
Corn fodder.....	5, 120	.4	10, 546	2.0	15.85	81, 188	.1
Other forage.....	29, 986	2.0	237, 450	7.9	27.00	899, 194	.9
Pasture.....	292, 046	19.6	-----	-----	11.88	3, 469, 810	4.3
Total.....	810, 106	54.4	1, 575, 386	1.9	25.60	20, 745, 188	25.6
Vegetables and truck:			<i>Bushels</i>				
Beans.....	17, 977	1.2	286, 427	15.9	50.67	911, 035	1.1
Onions.....	2, 759	.2	912, 695	330.8	315.76	871, 200	1.1
Potatoes, white.....	63, 504	4.2	10, 531, 091	165.8	39.68	2, 519, 924	3.1
Potatoes, sweet.....	693	-----	85, 841	123.9	154.00	106, 718	.1
Truck.....	46, 521	3.1	-----	-----	190.99	8, 885, 234	10.9
Total.....	131, 454	8.8	11, 816, 054	89.9	101.13	13, 294, 111	16.4
Fruits and nuts:			<i>Pounds</i>				
Apples.....	23, 811	1.6	328, 615, 608	13, 801	200.91	4, 783, 873	5.9
Peaches.....	3, 118	.2	21, 004, 822	6, 736	129.95	405, 191	.5
Pears.....	5, 431	.4	44, 477, 084	8, 189	147.19	799, 386	.9
Prunes.....	2, 572	.2	17, 295, 664	6, 724	92.44	237, 746	.3
Citrus fruit.....	6, 231	.4	46, 825, 676	7, 515	191.93	1, 195, 898	1.5
Small fruit.....	3, 162	.2	23, 879, 909	7, 552	240.43	760, 236	.9
Miscellaneous.....	5, 718	.4	17, 374, 706	3, 038	155.91	891, 501	1.1
Total.....	50, 043	3.4	499, 473, 469	9, 988	181.32	9, 073, 831	11.2
Miscellaneous:			<i>Tons</i>				
Sugar beets.....	71, 250	4.8	778, 365	10.9	78.50	5, 592, 982	6.9
Cotton.....	229, 560	15.4	{ 2 96, 740, 000	421.4	97.80	22, 450, 340	27.7
Cottonseed.....	931	-----	{ 2 179, 673, 260	782.7	31.14	28, 990	-----
Cane.....	98, 436	6.6	2, 659	2.8	5.38	529, 699	.6
Other crops.....	-----	-----	-----	-----	-----	-----	-----
Total.....	400, 177	26.9	-----	-----	71.47	28, 602, 011	35.3
Duplication.....	287, 631	19.3	-----	-----	-----	-----	-----
All crops.....	1, 489, 240	100.0	-----	-----	54.44	81, 077, 750	100.0

¹ Data are for calendar year (irrigation season) except on Salt River project, where the data are for corresponding "agricultural year," October, 1927, to September, 1928.

² Pounds.

³ The dry-farmed area of this total amounted to 103,680 acres, with a total value of \$838,950.

RECLAMATION TABLE 22.—*Irrigated and cropped acreage and crop values by years*

	Federal irrigation projects				Warren Act land				Entire area		
	Irrigated acreage	Cropped acreage	Crop value		Irrigated acreage	Cropped acreage	Crop value		Cropped acreage	Crop value	
			For year	Cumulative total			For year	Cumulative total		For year	Cumulative total
1906	22,300	1,20,100	\$244,900	\$5,005,300					1,20,100	\$244,900	
1907	187,600	1,169,000	4,760,400	85,005,300					1,169,000	4,760,400	\$5,005,300
1908	289,500	1,260,500	7,575,800	12,581,100					1,260,500	7,575,800	12,581,100
1909	410,600	1,369,500	11,920,700	24,501,800					1,369,500	11,920,700	24,501,800
1910	465,100	413,000	12,974,600	37,476,400					413,000	12,974,600	37,476,400
1911	541,400	470,100	12,708,600	50,185,000					470,100	12,708,600	50,185,000
1912	588,400	540,000	13,825,400	64,010,400					540,000	13,825,400	64,010,400
1913	699,200	642,200	15,732,200	79,742,600					642,200	15,732,200	79,742,600
1914	761,300	703,400	16,475,500	96,218,100					703,400	16,475,500	96,218,100
1915	814,900	760,000	18,200,000	114,418,100					760,000	18,200,000	114,418,100
1916	923,000	858,300	32,816,000	147,234,100					858,300	32,816,000	147,234,100
1917	1,057,500	966,800	56,462,300	203,696,400					966,800	56,462,300	203,696,400
1918	1,141,500	1,051,200	66,821,400	270,517,800	1,481,600	1,481,600	\$35,000,000	\$35,000,000	1,552,800	101,821,400	305,517,800
1919	1,187,300	1,113,500	88,974,100	359,491,900	916,300	880,600	64,000,000	\$99,000,000	1,984,100	152,974,100	458,491,900
1920	1,223,500	1,153,800	96,171,700	455,663,600	981,300	930,900	47,303,300	146,303,300	2,205,400	162,707,400	572,160,400
1921	1,267,500	1,157,900	49,020,300	475,253,900	1,001,300	969,600	44,906,100	191,411,900	2,217,500	113,677,500	685,837,900
1922	1,202,130	1,104,100	50,360,900	525,614,800	983,300	951,300	33,240,800	224,652,700	2,263,430	94,526,400	780,364,300
1923	1,213,700	1,179,870	63,046,300	590,661,100	1,051,400	993,000	37,557,900	262,210,600	2,283,100	102,604,200	882,968,500
1924	1,280,900	1,216,000	66,488,600	657,149,700	930,700	889,500	43,237,500	305,448,100	2,221,000	109,726,100	992,694,600
1925	1,320,300	1,242,800	77,608,900	734,758,600	1,019,200	951,300	53,655,900	359,104,000	2,339,500	121,284,800	1,113,979,400
1926	1,411,000	1,361,500	60,664,900	795,423,500	1,097,200	949,600	49,750,000	408,854,000	2,308,200	131,414,900	1,245,394,300
1927	1,379,000	1,431,600	72,047,200	867,470,700	1,148,100	1,072,500	61,160,000	470,014,000	2,527,100	110,414,900	1,355,809,200
1928	1,442,100	1,488,200	81,077,800	948,548,500	1,235,000	1,192,000	62,495,300	532,509,300	2,677,100	143,573,100	1,499,382,300

1 Estimated.

RECLAMATION TABLE 23.—*Summary of livestock and equipment on reclamation projects at close of 1928*¹

	Number	Value	
		Each	Total
Horses.....	75,206	\$51.98	\$3,909,739.00
Mules.....	10,433	90.71	946,207.00
Beef cattle.....	67,494	62.00	4,185,105.00
Purebred sires.....	495	98.62	48,816.00
Scrub sires.....	172	59.00	10,266.00
Dairy cattle.....	126,526	79.20	10,021,443.00
Purebred sires.....	1,229	144.66	177,797.00
Scrub sires.....	958	55.51	53,179.00
Sheep ²	413,125	10.05	4,153,528.00
Hogs.....	123,577	10.05	1,155,172.00
Brood sows.....	14,100	19.82	279,438.00
Rabbits.....	2,170	1.28	2,780.00
Fowls.....	1,935,707	1.29	2,498,919.00
Bees (hives).....	38,826	6.62	257,055.00
Total stock value.....			27,699,384.00
Value of equipment.....			³ 14,362,707.00
Total stock and equipment.....			42,062,091.00
Increase in value over 1927:			
Stock.....			3,748,382.00
Equipment.....			1,557,724.00
Total increase.....			5,306,106.00

¹ Data are for calendar year except on Salt River project, where data are for "agricultural year," October, 1927, to September, 1928.

² On the Rio Grande project 464 goats were raised and counted in with the sheep, valued at \$2,816.

³ Value of equipment on Salt River project is estimated.

RECLAMATION TABLE 24.—*Carload shipments to and from Federal irrigation projects in 1928*

State and project	Carloads of products shipped to projects		Carloads of products shipped from project	
	Total number	Total value	Total number	Total value
Arizona: Salt River.....	23,604	\$48,097,360	24,590	\$45,080,999
Arizona-California: Yuma.....	1,328	2,856,700	3,559	3,698,000
California: Orland.....	302	243,850	657	1,620,950
Colorado: Grand Valley.....	2,152	3,225,500	5,465	6,517,650
Idaho:				
Boise.....	13,141	18,747,885	10,104	27,963,910
Minidoka.....	2,840	2,126,347	6,302	5,509,709
Montana: Sun River.....	95	97,700	391	424,800
Nebraska-Wyoming: North Platte.....	10,739	7,591,890	14,283	30,139,650
New Mexico: Carlsbad.....	1,816	1,828,600	1,063	2,218,175
New Mexico-Texas: Rio Grande.....	7,758	9,997,650	3,850	2,218,175
Oregon:				
Umatilla.....	456	461,520	731	283,173
Vale.....	90	178,000	101	239,000
Oregon-California: Klamath.....	23,220	17,152,690	13,581	15,855,790
South Dakota: Belle Fourche.....	398	398,000	815	1,614,800
Utah: Strawberry Valley.....	4,072	2,771,595	4,825	3,817,880
Washington: Yakima.....	3,052	3,114,700	20,400	10,037,300
Wyoming: Shoshone.....	433	729,375	1,885	1,055,680
Total.....	95,496	119,619,362	112,602	158,295,632

RECLAMATION TABLE 25

PROJECTS TURNED OVER TO WATER USERS' ORGANIZATIONS FOR OPERATION AND MAINTENANCE

Project	Year	Remarks
Salt River project, Arizona.....	1917	Association operating entire project.
Boise project, Idaho.....	1926	United States operating reserved works; Board of Control operating transferred works.
King Hill project, Idaho.....	1926	District operating entire project.
Minidoka project, Idaho:		
Gravity division.....	1917	United States operating reserved works.
South side pumping division.....	1926	Do.
Huntley project, Montana.....	1927	District operating entire project.
Sun River project, Montana: Fort Shaw Division.	1926	United States operating reserved works.
North Platte project, Nebraska-Wyoming:		
Interstate division.....	1926	Do.
Northport division.....	1927	Do.
Fort Laramie division.....	1927	Do.
Newlands project, Nevada.....	1927	District operating entire project.
Umatilla project, Oregon.....	1926	Districts operating entire project, except McKay Reservoir.
Strawberry Valley project, Utah.....	1927	Association operating entire project.
Okanogan project, Washington.....	1929	District operating entire project.
Shoshone project, Wyoming: Garland division..	1927	United States operating reserved works.

PROJECTS TO BE TURNED OVER TO WATER USERS' ORGANIZATIONS FOR OPERATION AND MAINTENANCE

Grand Valley project, Colorado.....	{ 1932 and 1937	{ Contract pending.
Uncompahgre project, Colorado.....	{ 1932 and 1937	{ Contract executed. Entire project to be transferred.
Milk River project, Montana.....	1936	Certain works to be reserved.
Sun River project, Montana: Greenfields division.	1932	Contract executed.
Lower Yellowstone project, Montana.....	1932	Contracts executed. Entire project to be transferred.
Belle Fourche project, South Dakota.....	1934	Do.
Shoshone project, Wyoming: Frannie division..	1930	Contract executed. United States to operate reserved works.



